

# Contractors and Engineers Monthly

Vol. 36, No. 5

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## Highlights Of This Issue

- **Well-Organized Concrete Job**  
On a 122-mile cut-off on the Old Spanish Trail in Mississippi last summer, the paver and batch trucks ran on the shoulders, speeding up the setting of the steel. See page 2.
- **New Flood-Control Dam**  
"Co-adventurers" is the term applied to the group of contractors which put in a joint bid and received the contract for the construction of Prado Dam in Riverside County, Calif., an earth-fill dam with a volume of 3,130,000 cubic yards which is a part of the flood-protection program in California. See page 2.
- **Wide Range of County Work**  
The Public Works Department of Fulton County, Ga., carries on a variety of work in addition to the road construction and maintenance in the county, including the construction of sewers, parks, golf courses and drainage projects. See page 2.
- **Novel Methods on Bridge Job**  
H-beam pile bents replacing timber piles and ingenious methods and devices for carrying on the work characterized the construction of the Apalachicola River Bridge in Florida last summer. See page 6.
- **Roadside Development Pays**  
Some of the work carried on by the Alabama Highway Department along its roadides to increase safety and attractiveness and decrease maintenance costs are described in this issue. See page 18.
- **Soil-Cement Stabilization**  
In accordance with South Carolina's policy of stabilizing all subgrades, a series of contracts for stabilized base and bituminous surfacing was completed last summer. One 4.3-mile job of portland-cement stabilized clay base and bituminous surfacing is described in this issue. See page 29.
- **Field Shop on Sand Boats**  
"Ships of the Desert" took on a new form on the All-American Canal job when one of the contractors for the 120-mile Coachella Branch devised an efficient field repair shop mounted on sand boats for easy transportation over the loose sand. See page 37.

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C. & E. M. Photo  
Building and Spraying a Conical Pile of Aggregate to Produce Road-Widening Material for a Vermont State Road

## Narrow Main Road Widened With Mix

**Vermont Finds Economical Way to Add 6 Feet to the Width of U. S. 2 Between Montpelier and Burlington**

(Photos on page 48)

◆ THE 18-foot concrete highway which winds through the picturesque hills of Vermont from its capital city, Montpelier, to its western border city, Burlington, on the shore of Lake Champlain, was not built for the volume and speed of motor traffic which now uses it. The concrete roadway, in addition to being

(Continued on page 19)

## Annual Roadside Development Awards To Be Presented to Contractors by This Magazine

◆ HIGHWAY contractors have contributed in considerable measure in the past to the success of roadside-development projects along state highways and we believe that they can contribute much more in economies and methods of achieving the goal of more attractive roadides that can be maintained at less cost. To foster this, CONTRACTORS AND ENGINEERS MONTHLY announces the first of a series of Annual Awards to contractors or their superintendents for excellence of execution of roadside-development projects, or for the best suggestions for more effective methods to achieve better results or greater economies on such projects.

An award of an engrossed certificate will be made in each of the four geographical sections, East, South, Central and West, and one of these will receive the National Award of an engraved trophy as evidence of his outstanding contribution to better roadides in the United States.

The nominations for the awards will be made in each state by state highway department engineers on or before September 15, each state being permitted a

## Air Tunnel Sections Through Bad Rock For N. Y. Subway

(Photo on page 48)

◆ THE completion of Section 6 of the new Sixth Avenue Subway from Waverly Place to 18th Street, New York City, required the driving of two compressed-air tunnels on either side of the existing Hudson & Manhattan Tunnel from midway between 8th and 9th Streets to 13th Street, while the H & M was operating under heavy traffic. The contractor, Spencer, White & Prentiss, Inc., of New York City, assembled a 17-foot 10½-inch shield on the job in a novel manner described below. The shield was driven 361 feet in the east tunnel and 1,045 feet in the west tunnel. The careful preliminary work and the installation of the power plant and compressors on the mezzanine of the existing subway station at 4th Street were described in detail in CONTRACTORS AND ENGINEERS MONTHLY for May 1938, and in June 1938 appeared an article on the open-cut excavation in this same section of the subway project.

Since the Hudson & Manhattan Tubes occupy the center of the street, this section of the new Sixth Avenue Subway had to be divided and run on the east and west sides of the Tubes at a lower grade. Many of the buildings along the Avenue are old and the space required for but one track of a modern subway

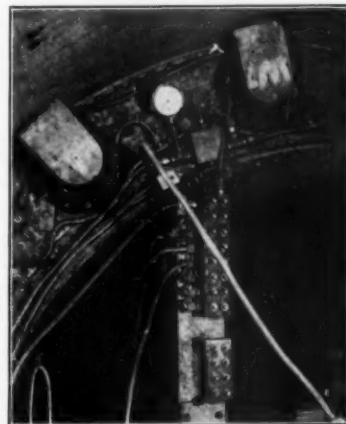
**Work Carried on Beneath H & M Tubes, Old Buildings And "El" on Difficult Job By Spencer, White & Prentiss**

forced the Board of Transportation engineers to locate the subway very close to the building line, as well as close to the Tube. Where the Tube enters Sixth Avenue on a curve, it was necessary at one point for the contractor to remove the bottom of several electric duct manholes and re-concrete them, and at other points several inches of the bottom of the concrete section of the H & M Tubes had to be removed to permit the shield to move forward at the designed grade. The designs for this section permit an extremely small clearance for the subway cars in the completed tunnel. Consequently the tolerances for the contractor's work were very small. Variation in the concrete lining of the tunnel, which has an inside diameter of 15 feet 9 inches, was held to ¼ inch.

### Character of the Rock

This section of the Sixth Avenue Subway is the most difficult in the entire length of the project because of the very variable character of the rock itself and also its unpredictable contour. Borings made by the Board of Transportation prior to the award of contracts were spaced approximately 200 feet apart, but when actual construction started the rock was found to vary as much as 10 feet in the diameter of the tunnel at points where borings might well have led one to believe that the rock dipped only a few degrees. Additional borings made by the contractor, as well as con-

(Continued on page 10)



Detail of the Upper Quadrant of the Spencer, White & Prentiss Shield

# Old Spanish Trail Cut-Off Concreted

**New Location of U. S. 90  
In Mississippi near the  
Louisiana Line Paved by  
Harrison Organization**

(Photo on page 48)

✦ A SECTION of the old Spanish Trail, a very heavily traveled thoroughfare along the Gulf shores of Alabama, Mississippi and Louisiana, was paved last summer as a new cut-off over a new right-of-way, straighter than the old, between Bay St. Louis and Pearlinton, Miss., on the Louisiana border, by-passing the latter town. This 20-foot concrete pavement 12.2 miles in length was held up for a long period in early April because of periodic rains that prevented the subgrade drying out sufficiently, but when it did dry the dust from the batch trucks kept the air filled with a continuous cloud. You couldn't see them for dust! Both paver and batch trucks ran on the wide shoulders on this contract, a novelty in Mississippi concrete construction although used extensively elsewhere whenever the shoulders will permit. There is much less interference with the setting of the steel for the center joints and the expansion and contraction joints and also the subgrade is not cut up by the constant shifting of the batch trucks.

## Grading and Form Setting

This cut-off was graded as a separate contract by another organization between January 16, 1936 and July 28, 1937. Harrison Engineering & Construction Co. began assembling its equipment January 19, 1938, although for two months previous it had been hauling in and stockpiling the aggregates at three locations as there was no rail connection in this section. Cement was brought in as needed by barge up the Pearl River.

On the fine grading for this contract Harrison used a Caterpillar Sixty and a Caterpillar Sixty-Five grader ahead of the Ted Carr Formgrader which cut the trenches on both sides for the 9-inch Blaw-Knox steel forms. The subgrade material beneath the bases of the steel forms was firmly tamped by a Lakewood mechanical form tamper with pipe handles handled by one man. A Blaw-Knox Flynn Surgrader rode the forms and cut the subgrade to a plane about 1/4-inch above the final grade, throwing the excess earth outside the forms. Behind the Surgrader a Caterpillar Thirty-Five with a Carr Push Planer and a Carr trail-grader attached with pipe pushers and braces cut the final 1/4 inch from the subgrade to a scratch template pulled by two of the grade crew which consisted of three foremen and sixteen men plus four form setters and helpers. The rear rail-grader of the tractor was weighted down over the forms with half barrels of concrete to get the maximum cutting effect. These would ordinarily have been attached to the paver but with that machine operating outside the forms this method was used. The final subgrade was 9-6-6-9 and the concrete as poured and finished had a 1-inch crown in the 20-foot width.

Between the Surgrader and the tractor final-grading outfit the contractor used a Wehr 7-ton roller with Allis-Chalmers power.

## Batching Set-Ups

The initial batching plant set-up was at the west end of the contract nearest to Pearl River where the cement was barged in and unloaded as required at a floating dock. At this point sufficient stockpiles of sand and gravel had been hauled in by truck to permit the paving



C. & E. M. Photo  
A Thirty-Five Tractor with a Carr Push Planer and Trail-Grader Finished the Grade as One Operation on the Harrison Engineering & Construction Co. Contract in Southern Mississippi

of 4 miles of the 20-foot 9-6-6-9-inch slab.

A Koehring crane with a 40-foot boom and a 1-yard Blaw-Knox clamshell loaded the aggregate into the Blaw-Knox batcher bins which delivered the weighed batches of 1,558 pounds of sand and 2,370 pounds of gravel to the 2-batch trucks as they backed under the plant. The batch trucks then drove out onto the road where a small platform served as a transfer point for the 7 bags of cement per batch from the hauling trucks to the batch trucks. Four men loaded or transferred the bags of cement to the batches. Out on the grade some 500 feet ahead of the paver was another platform at which another four men

(Concluded on page 23)



C. & E. M. Photo  
Spillway Excavation at Prado Dam. One of a Fleet of 25-Yard Terra-Clippers Pulled by D8's with a Pusher in Action During Loading

# Natural Flood Basin At Prado Dam, Calif.

**New Earth-Fill Dam Under  
Construction in Riverside  
County by Large Group of  
"Co-adventurers"**

(Photos on page 48)

✦ ANOTHER unit in the chain of flood control basins up and down the coast of Southern California is now under construction in Riverside County, near Corona, for the protection of Orange County, requiring the removal of the small community of Prado which is located in the borrow pit. Prado Dam, an earth-fill dam with a volume of 3,130,000 cubic yards, will create a flood control basin of 224,500 acre-feet at spillway crest, as it is located ideally in a narrow gorge of the Santa Ana River. A group of contractors referred to in the contract as "co-adventurers" is undertaking the project, each one having its own section. This group comprises W. E. Callahan Construction Co., Guthrie-Marsch-Peterson Co., Geo. W. Condon Co., and J. P. Shirley, operating as Prado Constructors, although the last name has no official recognition in the contract.

The need for such a project was brought forcibly to the attention of a large group of communities on March 2 and 3, 1938, when the waters of the Santa Ana River spread out over a wide area, inundating some dozen communities. The peak flood was 95,000 cfs. The

design of Prado Dam provides for a storm of 275,200 acre-feet, with an inflow of 193,000 cfs and an outflow peak of 9,200 cfs, or a reduction in peak of 183,800 cfs in the channel below the dam.

## Design of Dam

Prado Dam is an earth-fill structure with a 30-foot crest, a maximum height of 105 feet above the stream bed, and a maximum base of 800 feet. The dam is divided into three sections: a central section of select impervious material 10 feet wide at the top, with 1/2 on 1 slopes both upstream and downstream. This section is immediately over a core trench 40 feet wide at the bottom and with 1 on 1 slopes to the ground surface. A sheet-pile cut-off wall approximately 40 feet deep will be driven into consolidated material, along the center line of the core trench. The upstream section of the dam is made of random pervious material with an upstream slope of 3 on 1 and with rock paving. The downstream section is of pervious material with a slope at the top of 2.5 on 1 for a horizontal distance of 75 feet, then 3 on 1 to a rock-paved gutter and 20-foot berm 125 feet horizontally from the center line, then a slope of 5 on 1 to a second rock-paved gutter and 20-foot berm 300 feet from the center line, and continuing on a 6 on 1 slope to a rock toe 25 feet wide at ground level.

(Concluded on page 26)

# Road Construction In Fulton County

**"Bub" Clarke, Chief, Tells  
In Interview of Variety of  
Work Done By Public Works  
Dept. of Georgia County**

✦ FULTON COUNTY, Georgia, derives about 75 per cent of its income from its county seat, the City of Atlanta and its metropolitan areas, comprised of the cities of East Point, College Park and Hapeville, and unincorporated areas of Buck Head, Center Hill and Lakewood Heights, and about that percentage is spent by the County Public Works Department in those areas. Much of the work involved is frequently outside the field of highway construction and maintenance which is usually associated with the Office of County Superintendent or County Engineer.

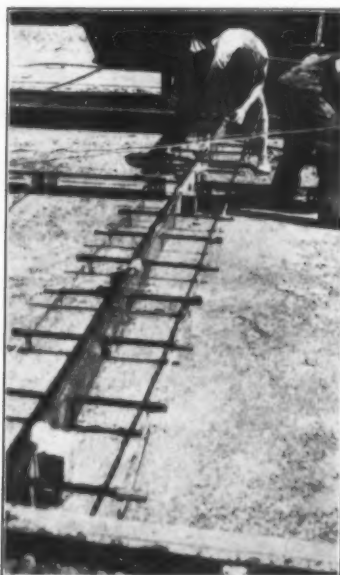
"Mr. Bub," as A. A. Clarke, Chief of Construction and Warden of Fulton County, is affectionately called by his associates and who has worked for the county since 1898 when he started driving a team, pointed out in an interview that road maintenance by convicts is just one of the many jobs undertaken by the county organization. Last year the county spent \$250,000 on a metropolitan sewer system for Atlanta, constructed with WPA labor, this expenditure being in addition to the regular appropriation of \$1,250,000 spent by the Public Works Department. In addition, the county had under way last year the construction of two 18-hole and one 9-hole golf courses; a park development consisting of three parks ranging from 42 acres in the smallest to 198 acres in the largest, with bridle paths, swimming pools, tennis courts, open amphitheater and baseball diamonds; and completed 27 miles of drainage work.

Fulton County has participated in the Federal relief program, and last year 22.3 miles of roads were surface treated and four new concrete bridges, ranging in length from 40 to 80 feet, were constructed. In addition, these forces built several miles of graded roads with the necessary small drainage structures. About 9,000 men comprise the relief forces working on roads and parks in Fulton County and another 10,000 working on sewers. All engineering on both WPA and county public works is handled through the county engineer's office. Earl E. Yantis, who has been with the county for 11 years, is County Engineer.

## Financing

The income for the Public Works Department comes from the county's share in the state gas tax and from a county tax on real estate for roads, the total amounting to about \$1,250,000 a year. A recent act of the Legislature exempting from the real estate tax all persons living in their own homes assessed at not more than \$2,000 for the property

(Concluded on page 24)



C. & E. M. Photo  
Placing the Expansion Joint Steel



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## Jobs As Monuments

By H. J. NEALE,

Landscape Engineer, Virginia Department of Highways; Chairman, Joint Committee on Roadside Development of the American Association of State Highway Officials and the Highway Research Board

Without doubt the oldest existing highway monument in the world can be credited to that great Roman Emperor Appius Claudius. How many highways of yesterday or today are regarded as memorials to their builders? The achievements of the builders of the Appian Way evidently influenced the bridging of the Alps and the building of permanent roads throughout the civilized world of that era. Many of these pioneer roads are still usable after twenty-two centuries and serve as monuments to their day and age.

Today we are annually adding to the 410,628 miles of improved highways in the United States, where we have over 800,000 miles of roadsides, since for every mile of centerline there are two miles of roadsides and land frontages. The problem of the designer and builder today is two-fold; to construct a roadway capable of meeting the most severe tests of modern traffic, and at the same time protect these vast investments and the values of adjoining lands. The real monuments of today and tomorrow must, therefore, include the roadside as well as the roadbed, and the road builders or contractors who take pride in their workmanship and endeavor to emulate in a measure the great Roman Emperor's contribution to posterity must build the road and also protect the roadside.

Nature is a wonderful healer when given the opportunity, but when robbed and depleted is helpless. Without nature's aid our roadsides become eyesores—barren wastes subject to erosion and depreciated land values. It is not necessary to establish gardens on our roadsides to aid nature, but a careful handling of available fertile top soil, the preservation of existing ground covers, shrubs, and vegetation, the protection of trees—not only of their tops but more particularly of their root systems—and the careful guarding of moss-covered rock outcrops all add to the values of nature along our roads. There are also other factors of modern road building, such as location and excavation of borrow pits along the roadsides, the obliteration of old roadbeds, and lastly the dressing up of projects and putting nature to work again, which will have their enduring influence on the highway roadsides of tomorrow. When contractors and road builders take an interest in these factors, commensurate with the interest they manifest in the actual construction of the roadbeds, our highways will function in a larger measure in helping to give our people their ordained and inalienable rights of life, liberty, and the pursuit of happiness. No other single agency in the present day and age has a greater oppor-

tunity to furnish our people with these inalienable rights than our highways.

On behalf of the Joint Committee on Roadside Development of the American Association of State Highway Officials and the Highway Research Board, I want to express my appreciation to CONTRACTORS AND ENGINEERS MONTHLY for its continued interest and activities in behalf of improved and developed roadsides, and more particularly in making possible the awards of merit for outstanding achievements by contractors in the art of roadside development. Today roadside activities are recognized as important factors in road building in every state in the Union. Not only is interest in our roadsides accepted by our highway officials, but the values accruing from intensive roadside development programs are meeting with popular acclaim from garden clubs, civic organizations, business men, and land owners. Contractors have not been averse to cooperating with state agencies in general, but it is felt that a great deal more can be accomplished if all of the contractors and their representatives can be more fully advised of the values that will result by their keener interest, and in the end their cooperation will redound immeasurably to their credit.

In a large measure they will be making important contributions to the economic, utilitarian, and aesthetic values of our vast highway system. The sooner that engineers, road builders, contractors, and others actively engaged in the building of our modern highway system appreciate the value of tying the roads into the countryside, building not only for the safety and convenience of the traveling public, but adding their mite to making conditions along the roadsides comparable with the pavement and the adjoining countryside, all will be making of their jobs monuments with lasting values for posterity.

### Make Road Jobs Safer

Accidents involving workers on highway construction are on the increase, according to a recent report from the National Safety Council. It is suggested that the frequency of such accidents can be reduced by more care in regulating the traffic on such jobs.

Flag men or signal men should be alert and intelligent, courteous and firm, and picked especially for the job. They should wear red coats, vests or sashes. One company dresses its flag men in red smocks. The red flag should not be used for signaling but should be held in plain sight at right angles to the line of traffic and the free hand should be used for giving traffic signals.

## Arizona Reorganizes Maintenance Work

In an effort to reduce expenditures and promote greater efficiency in the Arizona Highway Department, the maintenance division of the department has been revamped and streamlined. It is estimated that the new method of road maintenance will result in a saving to the state of \$300,000 a year.

Under this streamlining process, the state has been divided into four districts, each district under the supervision of a district engineer with headquarters at Phoenix, the state capital. These district engineers, all of whom have had many years of service with the highway department, are Joe DeArozena, F. N. Grant, R. C. Perkins, and J. B. Van Horn. Each of the four districts has been divided into four sub-districts, with a resident engineer in charge of maintenance and construction in his sub-district. Under this set-up, sixteen resident engineers are now serving instead of forty-two maintenance foremen. Resident engineers have their headquarters at centrally located places in the sub-districts.

Transformation from the system of maintenance supervision to the resident-engineer plan was directed by W. R. Hutchins, recently appointed State Highway Engineer of Arizona, who has served the Department as a district engineer for 15 years. Harry Duberstein, who for years has been Maintenance Engineer, has been made Right-of-Way Agent. Mr. Duberstein assisted Mr. Hutchins and the Highway Commission in revamping the maintenance division.

## Soil-Cement Road Unaffected by Cold

Maryland's first soil-cement stabilized road constructed last year between Stockton and Little Mills shows little or no effect from the freezing and thawing during the winter months, according to a report from the Maryland State Roads Commission. The soil-cement stabilization is in excellent condition, except for one place about 10 feet long and 2 feet wide on the extreme edge of the 16-foot pavement. Maryland engineers believe that this failure is probably due to a lack of sufficient cement.

However, the bituminous surface on top of the soil cement has not stuck as well as was anticipated, about 10 per cent of the surface treatment having scaled off. It is believed that this trouble can readily be overcome on future contracts and that the Stockton-Little Mills road can be built up very satisfactorily by applying 0.33-gallon of RC-1 or RC-2, covering with No. 4 chips, sealing with a coat of 0.25-gallon of bituminous material and again covering with No. 4 chips.

The construction details of this project were described in an article in the February issue of CONTRACTORS AND ENGINEERS MONTHLY, page 11.

## "Sack of Cement" Gifts To Aid Panama Highway

A new scheme to aid highway development in Panama, advanced by a young Panamanian in the interior, has met with considerable enthusiasm among the populace of that country, according to a recent report from the U. S. Bureau of Foreign and Domestic Commerce. An account has been opened in the Central Bank of Panama and is known as the "Saco de Cemento" (Sack of Cement), to which Panamanians and foreigners have been asked to contribute 65 cents, the cost of one sack of cement. The funds collected will be used exclusively for the purchase of cement to pave the highway between Panama City and David. It is believed that the cement fund will aid materially in financing the paving of this highway.



The Maintenance Man's Lament: "On and On We Go—Building, Repairing, Destroying, Unknown and Unsung."

## England Inks Road Surface To Secure Texture Prints

A new method of recording road surface texture which is being applied in England was reported in a recent issue of *Highway Research Abstracts*. The surface to be examined is brushed over with a letter-press black ink to give as thin and uniform a film as possible. A perfectly smooth tire inflated to normal pressure and carrying its rated load is rolled over the inked road and then onto a sheet of paper held firmly on a flat surface. The tire prints on the paper an exact record of the parts of the road surface with which it has been in contact.

An open-texture road may give actual contacts with a smooth tire of from 20 to 70 per cent of the ellipse of contact of the same tire on a smooth surface. This implies that on open-texture roads the mean pressure between tire and road over the actual area of contact may be several times greater than it is on a close-texture or smooth road. Liquid on a surface of this kind is therefore expelled more easily from between tire and road by the high pressure. In addition, the many spaces between contact areas allow the liquid to escape more readily. Examination of ink prints from roads known to be slippery has shown that on these surfaces the tire makes contact with the road over almost the entire area of the ellipse of contact, while the number of individual contacts in this area is small.

Apart from its direct bearing on road slipperiness, the texture print is of value in allowing wear and other changes which take place in road surfaces to be recorded.

## Beware of Poison Plants Along Highway Jobs

Workers on grading and highway jobs are often exposed to poison oak and poison ivy. Frequently, entire families have been affected because the oily substance from the leaves is deposited on the clothes of the worker and thus transmitted. To avoid this danger, the National Safety Council suggests that following exposure, clothing be dry-cleaned. Soap and water solution for cleaning clothes is not always effective in removing the oil.

The worker exposed should wash his hands and arms thoroughly with laundry soap, at least five or six times. If convenient, the arms should then be washed with rubbing alcohol.

The oily secretion may be so finely divided by burning the plants that minute droplets will be deposited upon the skin of persons exposed. Frequently men have suffered from badly swollen tongues and faces following the burning of poison oak and poison ivy. A number of internal remedies are on the market, as well as such lotions for external use as 5 per cent solution of ferric chloride in 50 per cent alcohol, calamine lotion to which carbolic acid has been added to make a 2 per cent solution, and several others. It is recommended that for the proper care of severe cases a doctor should be consulted.



**Road Equipment Bulletin**

A new condensed catalog on its line of road equipment has been issued by the J. D. Adams Co., Indianapolis, Indiana, to acquaint the reader with the units manufactured by them and their various applications. It contains photographs and brief descriptions of the Adams leaning-wheel, motor and elevating graders, the retread paver, Multi-Blade maintainer, rotary scrapers, wheeled scrapers, road rippers, road plows, and several other pieces of equipment. Copies of this condensed catalog on the Adams line, or a complete cata-

log on the particular machine in which you may be interested, will be sent to you by the manufacturer upon request.

**Dirt-Moving Units**

The Brooks Equipment & Mfg. Co., Knoxville, Tenn., has issued a bulletin on its Load-Lugger units for use on innumerable types of material-handling jobs wherever loading is done by hand, as well as for snow removal and spreading cinders or calcium chloride. The bucket, which stands 24 inches, can be loaded speedily and only a few seconds are required for attaching the

bucket and lifting the load to the truck chassis. It is a one-man-operated unit and may be installed on any truck chassis. A copy of this catalog may be secured direct from the manufacturer by mentioning this item, or from this magazine.

**New Ransome Dealer**

The Servis Equipment Co., Dallas, Texas, has recently been appointed by the Ransome Concrete Machinery Co., Dunellen, N. J., to handle its line of concrete pavers and mixers in the counties surrounding Dallas.

**Portable Roller Bulletin**

A low-cost roller suitable for use in rolling all kinds of patch material is described and illustrated in Bulletin 194 issued by the Galion Iron Works & Mfg. Co., Galion, Ohio. This roller, which weighs up to 3,600 pounds, can be quickly attached to a truck and the roll raised off the ground by means of a hydraulic lift, for towing from place to place at truck speed. Complete specifications and dimensions are also given in this bulletin, copies of which may be secured by those interested direct from the manufacturer.

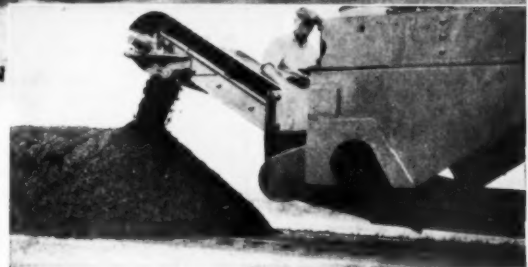
# UP TO 16 CU. FT. WINDROWS - AT 160-180 TONS AN HOUR



## From Minnesota to Mexico, Outstanding Records Prove This Traveling Pugmill a Major Advance in Road Building...

By the end of 1938, with hundreds of miles of road completed in numerous states, ranging from half width retreads of 1" thickness up to 36 ft. sand-clay-gravel stabilization in 3" compacted courses, Jaeger proved to the road-building field the high production, thoro mixing and sensational economies of the one-pass pugmill Road Builder.

Ability to thoroly mix up to 16 cu. ft. windrows of stabilization materials (160-180 tons an hour) with one machine and one operator and with subgrade absolutely clean for inspection or application of tack coat — to measure and apply water for compaction or bitumen for binder — to both mix and smoothly finish bituminous wearing courses in one operation by use of Spreader-Finisher attachment — to produce daily by means of an inexpensive tractor-drawn model, over 3 miles of light 10 ft. retreads, ready for rolling — these are job facts of tremendous importance to contractors figuring 1939 work. Let us give you the story in detail. THE JAEGER MACHINE CO., 701 Dublin Ave., Columbus, Ohio.



Gathering Screws in Front, Belt Attachment at Rear — NO BUCKETS TO CLOG AND STOP WHEN MATERIAL IS STICKY WET.



PUMPS ACCURATELY MEASURE AND APPLY WATER OR BINDER. Reserve Tanks Keep Machine Working Until Next Supply Truck Arrives.



JAEGER BITUMINOUS PAVER  
For Precision Smooth Pavements at Low Cost

## JAEGER Mix-in-Place ROAD BUILDER



JAEGER AUTOMATIC FINISHER  
For Highest Type Concrete or Bituminous

# H-Beam Pile Bents Carry Long Bridge

**Kershaw Contracting Co.  
Used Novel Methods on  
Florida Structure over  
Apalachicola River**

(Photos on page 48)

† AGAIN we are happy to record a construction project that has progressed rapidly and satisfactorily due largely to the ingenuity of the contractor in devising simpler, more direct methods and novel devices for reaching his objective, —the rapid completion of a project with greater economy. The Apalachicola River Bridge on U. S. 90 in northwestern Florida, just below the confluence of the Flint and Chattahoochee Rivers, and a stone's throw from the Georgia state line, was largely rebuilt last spring as FAP 3B for a length exceeding 3,708 feet. The unusual situation of 103 spans on 103 bents did not leave one end in mid air, but instead it connected with the west end of the main channel section of the old concrete arch bridge. The new approach structure extends west from the old bridge with an 1,281.56-foot tangent and 2,426.44 feet of bridge on a 1-degree 30-minute curve. The location was made under extreme difficulties because of 18 feet of water over the flat lands but the ends of the bridge met in accordance with the designs.

## Pile Bents and Pile Jackets

The structure consists of 103 bents of 12-inch H-beams with four piles to a bent, except that every tenth bent is double, using 10-inch piling. On the single bents the piles were driven 7 feet on centers with 36 feet between bents, using a 4,000-pound drop hammer. The piles varied in length from 40 to 75 feet and were driven in accordance with test borings made every 100 feet, maximum distance, and test piles averaging 250

feet apart. The varying elevation of the strata of limestone rock into which the piles were driven to secure a minimum bearing of 35 tons made the varying lengths necessary. The limestone was in both hard and soft strata with from 15 to 20 feet of clay and gravel beneath the mud of the bottomland. The piles were driven usually to bearing in 20 feet but about 25 per cent of them had to be spliced. All of the 75-foot piles had 15 to 25-foot splices. These occurred at a point where it was no longer necessary to use the Insley steel tower for handling concrete to the deck so the steel tower was cut, a 35-foot wood boom added and the splicing done with this outfit handling the piles for splices during welding.

For moving the piles across the



Photo by C. W. DeGinther, U.S.B.P.R.

A Typical Pile Bent on the Apalachicola River Bridge

muddy bottomland to place, a temporary wood trestle was built carrying a standard-gage railroad and the galley on which the pile driver was mounted. This consisted of a 45-hp P & H hoist and had 52-foot leads. Inasmuch as some of the piles were much longer than the leads when the driver was running on the ground a novel extension was devised. It would not have been practical if the initial driving had been at all hard. A section of H-beam was clamped to the pile to be driven about 25 feet from the top and a driving head mounted on that. To carry the blow to the top of the pile a pair of 1 3/4-inch cables were connected from the lower driving head to the cap at the top of the pile. When the driving had proceeded to the point where the pile would fit into the 52-foot leads, the driving rig was removed and the pile driven in the conventional manner.

The piles were moved across the trestle on cars pulled by the usual railroad motor car used by section foremen,

(Continued on page 14)

## PRISMO SENSATIONAL NIGHT SAFETY MEASURE PERFECTED

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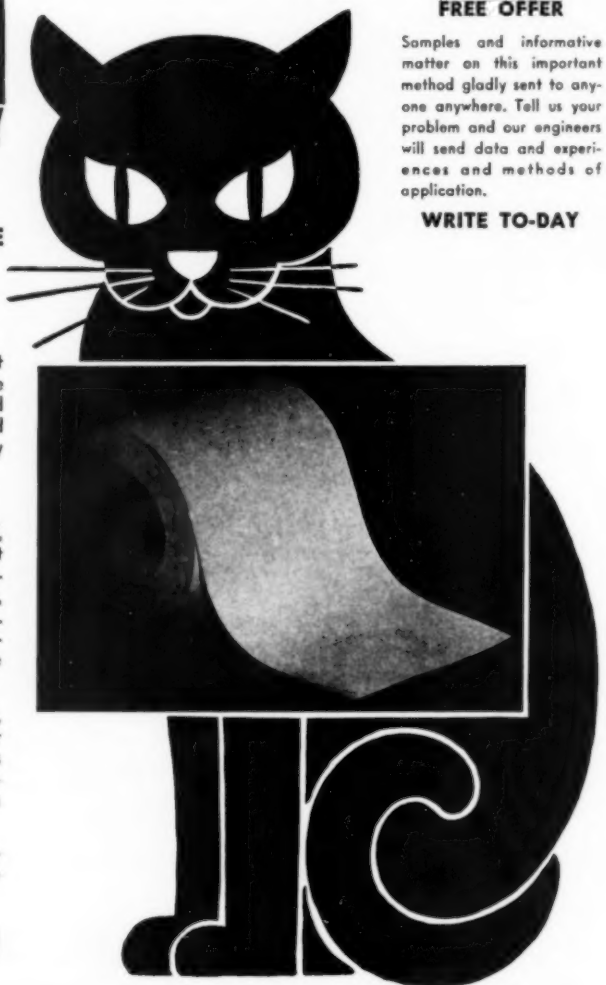
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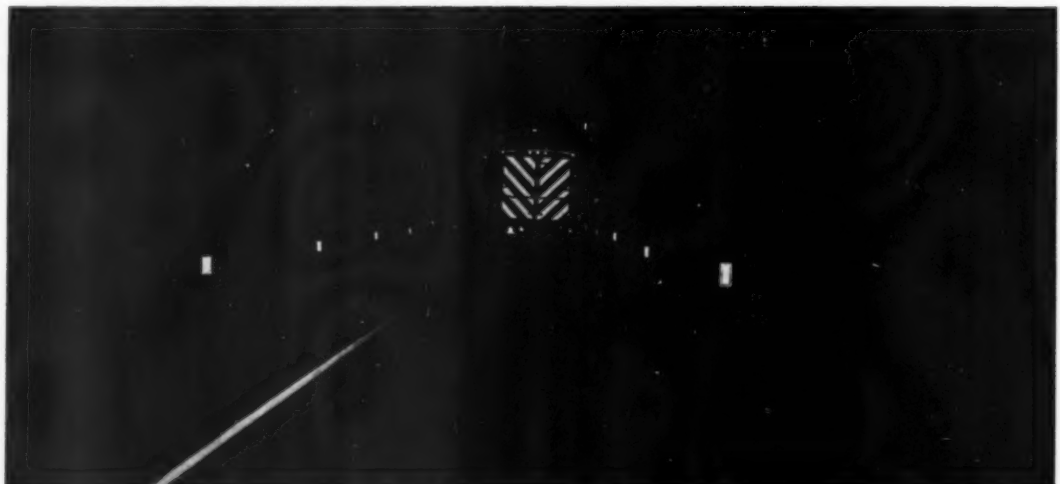
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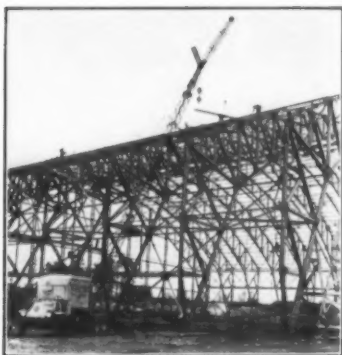
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A Universal-Lorain Truck Crane with a 110-Foot Boom Places Steel in a New U. S. Army Airplane Hangar at Fort Lewis, Washington

### Truck Crane Places Steel for Hangar

What is probably the largest airplane hangar in the United States is being erected at McCord Field at Fort Lewis in the State of Washington. The plans for this U. S. Army project call for the construction of four such hangars to be built in two pairs. The contract for the work was awarded to the Sound Construction Co. for \$806,248.

The hangars are being constructed of steel with heavy concrete footings and with cantilever roof trusses, the curved span of which is approximately 300 feet. The hangar will be 400 feet long and the height from the floor to the lower roof line approximately 100 feet.

The steel is being handled by a new 13-ton Universal-Lorain truck crane, owned by the Steel Erection Division of the Bethlehem Steel Co., Bethlehem, Pa. This machine is equipped with a 110-foot boom, consisting of the standard 80-foot boom and a 30-foot extension. The standard boom is made up of a two-piece 25-foot boom plus two 25-foot and a 5-foot center sections. All center sections are joined together with patented pin connections and the entire boom is of all-welded construction.

### Portable Job Hopper For Handling Concrete

The Ransome Concrete Machinery Co., Dunellen, N.J., has recently announced a new piece of equipment for use with truck mixers for speedy and

efficient loading of truck-mixed concrete into wheelbarrows and carts on smaller jobs. The Ransome truck-mixer job hopper is capable of receiving a full load of truck-mixed concrete and dispensing it into wheelbarrows and carts as needed, permitting the truck mixer to be dismissed immediately. The hopper has a center discharge equipped with two lever-operated double-clamshell discharge gates which control the flow of concrete.

In operation, the hopper can be towed to the job, riding on a special pneumatic-tired trailer under-carriage which is quickly detachable by the use of an eccentric lever and the removal of four bolts. At the job the steel-angle extension legs of the hopper are dropped from the carrying position and the channel skids connecting the legs are trued up to a level position. By means of sheaves and cable the mixer truck first lowers the hopper body by rotating it inside its frame to a receiving position, with one side of the hopper resting on the ground. Then, after dumping the entire truckload of concrete over the 3-

foot 7-inch high loading side, the mixer truck swings the hopper up to its discharging position by means of the same sheaves and cable, and it is automatically locked in an upright position. The concrete can be withdrawn as needed by running carts or wheelbarrows under

the two separate discharge openings.

This unit, which is 10 feet in height and less than 8 feet wide when in carrying position, is fully described in Bulletin No. 155, copies of which may be secured direct from the manufacturer or from this magazine.



MALL gas engine vibrator. Delivers 7000 vibration frequencies per minute. The same power unit can be used for concrete surfacing, sawing, sanding, drilling and pumping.

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CHANGING THE SHORE LINE of New York's Jamaica Bay in a \$28,000,000 improvement project, the Gahagan Construction Corporation is dredging, filling, grading, and building the Shore Parkway. Six drag-line units supplemented by two heavy tractors handle the moving of 8,000 cu. yds. of heavy muck every working day. Gahagan Dredge No. 5 is at work in the Bay.

Two other dredges are working in Utica, New York, and in Peru, S. A. Keeping on schedule means keeping equipment always on the job. The engineers are specific when it comes to lubrication. With Gahagan on the Shore Parkway, it's Texaco throughout, 100%, from fuels to lubricating oils and greases.

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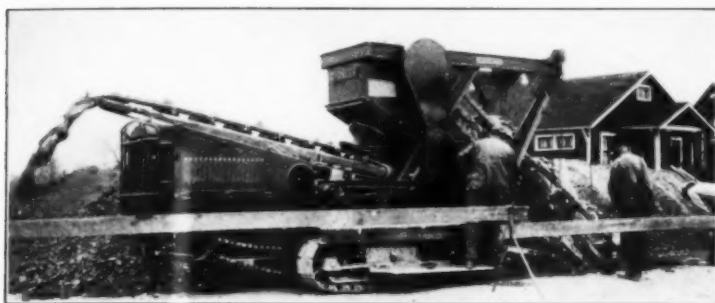
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The Cleveland Pioneer Trencher

### Trencher Redesigned For Better Balance

The Cleveland Pioneer trencher, well-known for its productive ability in digging water and sewer lines, has been completely redesigned by the Cleveland Trencher Co., 20100 St. Clair Ave., Cleveland, Ohio, to give a reduced overall width of only 62½ inches, with other improvements such as better balance fore and aft through redesign and a lower center of gravity. In the redesigned model the operator now faces his work immediately at the front and right of the machine, with the controls grouped so that he does not have to take his eyes from the trench to effect remote control of all of the transmissions.

All of the gears in the new Pioneer trencher are now sealed in steel housings and run in oil. The machine has been speeded up so that it now has a top speed of 22 feet per minute, where formerly, even in the easiest digging, its top speed was only 12 feet per minute. Self-starting diesels are now optional equipment because the Hercules diesel is interchangeable with the Hercules gasoline engine used as standard equipment. The crawlers have been increased in length to 9 feet 6 inches, giving a better working base for handling the machine. Through simplification of design throughout, all parts have become much more readily accessible for lubrication, adjustment and repair when necessary.

The new model preserves all of the features of earlier Pioneer trenchers, including the 180-degree arc of the discharge conveyor which can deliver dirt to the right or left of the trench, discharge it as close to the trench as desired, discharge it in front of either crawler to provide material for leveling

up the machine on side slopes, or discharge directly into dump trucks in front of or at either side of the machine.

### New B-E Dealers

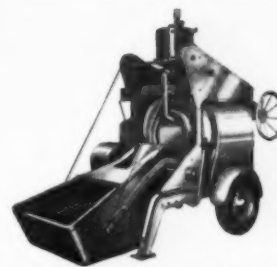
The Bucyrus-Erie Co., South Milwaukee, Wis., has announced the appointment of the following new distributors who will handle its line of excavating

machinery in their respective territories: Beckwith Machinery Co., of Pittsburgh, Bradford, Wilkes-Barre and Harrisburg, Penna.; Quinn R. Barton, Inc., 1305 W. Forsyth St., Jacksonville, Fla.; Fuchs Machinery & Supply Co., 1102 Farnam St., Omaha, Neb.; and the Great Lakes Supply Corp., 324 W. 36th St., Chicago, Ill.

### New Mixers for 1939

One of the features of the 1939 line of Speedline mixers, made by the Jaeger Machine Co., 701 Dublin Ave., Columbus, Ohio, is the improved and more compact design, including the replacing of the back-lashing lift cable and big overhead sheave with a single skip cable from a low accessible counter-shaft. This and other features of construction are reported to save considerable weight and at the same time permit oversize construction in machined-steel drum tracks, engines, clutches, shafts, gears and bearings.

Another feature of these mixers, which



One of the New Speedline Mixers

are available in 7-S, 10-S and 14-S sizes and are all equipped with the patented skip shaker loader, is the spring shock absorber mounting of pneumatic-tired wheels on Timken bearings, permitting towing of big mixers by a fast-moving truck or car. Two and 4-wheel mountings are interchangeable on these new Speedline mixers.

*Copying the work of one man is plagiarism; copying the work of several men is research.—Anon.*

## Cut yourself a Big Slice of Bank

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gauge . . . when it's level you know you're cutting the proper slope. When a wheel drops or raises, you simply re-level the platform by using the frame lean control. This automatically assures you straight slopes . . . eliminates extra rounds and costly hand labor.

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## Heavy Shield Assembled For Rock Tunnel in Air

(Continued from page 1)

stant pilot holes in all rock work, kept the contractor informed of the exact character of the rock. In the east tunnel, Manhattan schist was met in all conceivable variations from full face to no rock, the material with it consisting of boulders, a small amount of gravel and much "bull's liver." In the west tunnel, the Manhattan schist presented a full face throughout much of the length of the tunnel-in-air section, but there were many vertical faults and much disintegrated rock, as well as intrusions of quartzite and chlorite. The latter at times flowed freely through newly drilled holes, making it necessary to drill additional pilot holes to determine the character of the rock well beyond the face to be blasted.

### Assembling the Shield

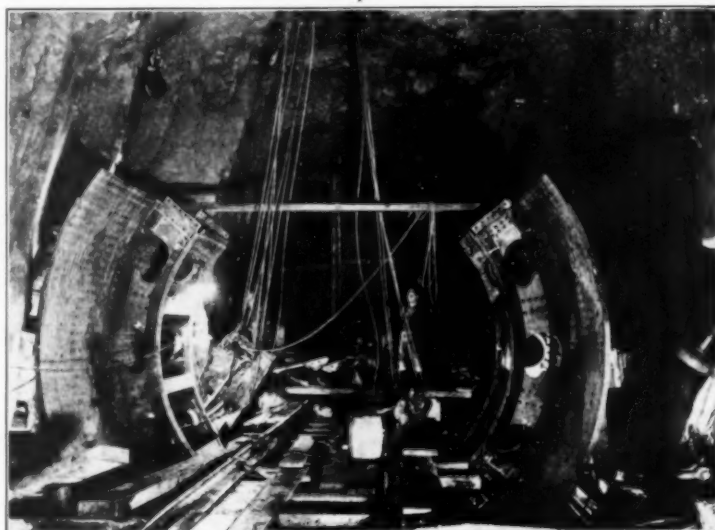
The steel shield, which has an outside diameter of 17 feet 10½ inches and weighs about 90 tons, was made by Union Iron Works at its plant in York, Pa., and delivered to the shaft at Waverly Place. Inasmuch as the point where the shield was to be assembled first in the east tunnel was some 300 feet north of the shaft, the delivery of the shield was made in four sections. A pit 5 feet 8 inches deep and with sufficient clearance to permit assembly, bolting and riveting of the shield, was excavated below the net line of rock in the tunnel. In this pit a series of steel rollers 12 inches in diameter and with 6-inch faces were set in concrete. Then the clumsiest piece of the shield, containing the hood, was set upside down on the rollers by manipulating it with two air hoists and cables threaded through 3 and 4-sheave blocks attached to slings in the roof. These slings were threaded through holes drilled from the street down into the tunnel and held by H-beam dead men at the surface. After the first piece of the shield was in place the second was brought in and set on the rollers adjacent to the first section and securely bolted to it. Successively, the remaining two sections were brought in on the industrial railway, maneuvered into position, and riveted to the other sections to form the complete shield upside down. Following this, and using the air hoists, the shield was rotated 180 degrees into an upright position. It was still about 5 feet below its proper elevation, so four 30-inch I beams were threaded through the shield and four 100-ton capacity hydraulic shield jacks raised the beams and shield until the center of the shield coincided with the center line of the rock tunnel. This had to be done in two lifts because of the limitations of the lengths of the pistons. When vertical jacking was complete, the shield was carefully cribbed and after the hydraulic connections had been made and all of the jacks set in place the shield was jacked forward about 40 feet to the point where it began to build iron.

After the shield had completed its 861-foot trip building iron in the east tunnel it was disassembled and removed in four pieces through a very small shaft at 13th

Street, using a Bucyrus steam crane in the street above. The four sections were then assembled by bolting in the yard at Waverly Place and the shield was carefully trued. It was again disassembled, lowered down the shaft, and carried through into the west tunnel to be assembled again. This was a particularly ticklish job, as the clearance between the two tunnels was only 8 feet 10 inches wide and 14 feet 5 inches high. It was necessary at one point to cut a hole in the mezzanine floor and to put the section of the shield containing the hood diagonally through the breach in the wall.

Before the shield could be assembled in the west tunnel, it was necessary to excavate a shield chamber. Even before this could be done locks had to be in-

(Continued on next page)



The Shield Being Erected in the East Tunnel of Section 6 of the New Sixth Avenue Subway for Which Spencer, White & Prentiss of New York Is the Contractor

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Photo by Lewis W. Hine

Harry Talbot, General Tunnel Superintendent in Charge of Compressed Air Operations

## Shield Operations In New York Subway

(Continued from preceding page)

stalled and a temporary 6-foot concrete bulkhead poured because the shield chamber was excavated under compressed air conditions at the site of a previous severe run and directly beneath the Hudson & Manhattan tracks. A heavy square steel frame was erected to act as a roof support for the Hudson & Manhattan and also for use in assembling the shield beneath. The top of the steel frame consisted of 14-inch CB sections on 5-foot centers supported by steel knee braces to steel wales carried on 12 x 12 wood posts. The top steel also rested on a steel needle at the ends supported by the 12 x 12 posts above the wales.

The shield chamber, after excavation, was concreted completely around to prevent any trouble with the earlier run. The temporary bulkhead was then torn out, the locks removed, and the shield sections brought in and assembled. Because of the necessity of changing from the square bent section to the circular section, the base of the rail in the final subway section had to be dropped approximately 2 feet. This made further excavation necessary for about 80 feet back from the tunnel-in-air section in the west tunnel, requiring also the underpinning of all adjacent columns of the existing Independent Subway.

### Permanent Bulkhead and Lock

In both the East and West Tunnels, as soon as the shield was assembled and shoved forward, the three required air locks were brought in, cribbed to their proper positions and then a concrete bulkhead 6 feet thick poured to seal off the tunnel and permit the start of tunnel-in-air operations. The man-lock was 26 feet 4 inches long inside and 29 feet long outside, while the muck lock was 33 feet long and the emergency lock 20 feet 9 inches in length. The maximum air pressure used in the East Tunnel was 16½ pounds and in the West Tunnel 14 pounds, while the average pressure was around 12½ pounds. Evidence that the air pressure was maintained uniformly was indicated by an examination of the charts from a Bristol recording gage in the office of the Tunnel Superintendent in the shaft office building.

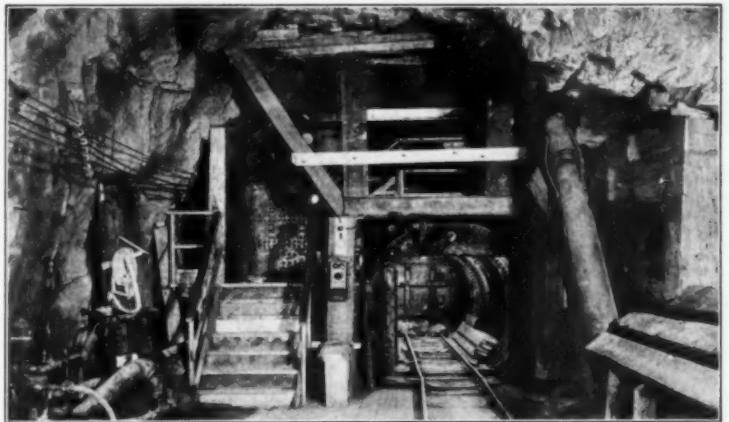
### The Tunnel in Air

Every utility required in the air section was carried through the bulkhead in duplicate, so that if for any reason an air, electric, power, telephone or hydraulic power line failed, a new connection could be made promptly to the duplicate line on the inside of the bulkhead. The various utilities were in the following locations as one faced toward

the shield. On the left side, starting near the bottom, was the 6-inch blow or smoke pipe. Immediately above this was the 6-inch high-pressure air line, then the 3-inch water line, then the 1½-inch hydraulic line carrying 4,500 pounds pressure. Above the spring line, on the left side of the tunnel, was the four-wire electric system carrying 220 volts. By using the neutral side of the line 110 volts were secured for electric light service. On the right of the tunnel were the 10-inch steel low-air-pressure line and high above it the wires for the blasting circuit. This line was carried into the man-lock, from which the charge in the face was fired. Numerous taps in the 3-inch water line furnished ample fire protection. At intervals of between 50 and 75 feet hose lines were left connected to these taps to fight fires which are such a great hazard in compressed-air operations.

### The Shield in Operation

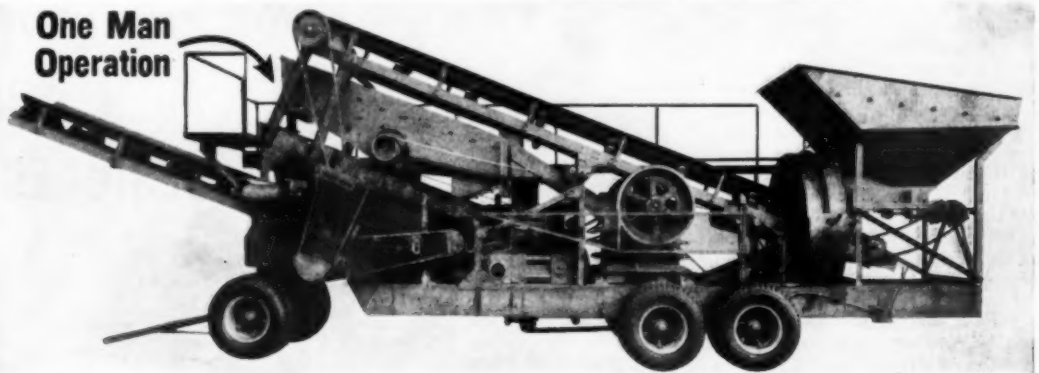
The special shield required for this tunnel carried 14 Watson-Stillman hy-



The Free Air Side of the Compressed Air Bulkhead in the East Tunnel, Section 6, of the Sixth Avenue Subway. The Man-Lock is Shown at the Upper Left with the Recording Air-Pressure Gage Mounted on It, the Emergency Lock in the Upper Right, and the Material Lock Below. The Timber Protection of the Low-Air Line is Seen in the Lower Right and a Small Sump Pump in the Lower Left

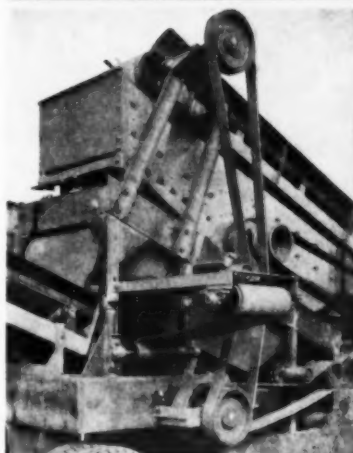
draulic jacks of 100 tons capacity each | are 10 inches in diameter and have a  
at 5,000 pounds pressure. These jacks | (Continued on page 30)

### One Man Operation



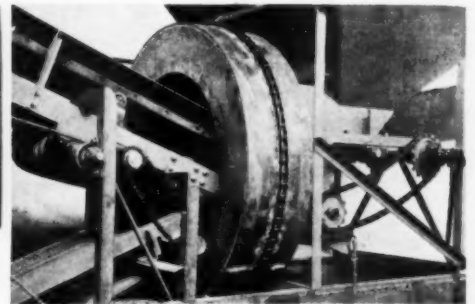
## New Dual Portable reduced in weight, length and width

**NOT CLAIMS, BUT FACTS**  
WEIGHT: 50,000 POUNDS  
LENGTH: 41 ft.-8 in. OVERALL  
WIDTH: 8 ft.-10 in. OVERALL



View showing Belt Drives with guards removed

Right, All-steel Rotary Elevator, with guards removed—a slow moving unit with abrasion-resisting steel buckets for long life.



### HOW IS IT DONE? BY USE OF ROTARY ELEVATOR (shown above)

The rotary elevator is not a Tel Smith invention. Among the first to apply it to portable rigs were the Yager Construction Co. of Fond du Lac, Wis., and Koplin-Kinas of Green Lake, Wis. Now seven Wisconsin contractors are using it. Because the rotary elevator has so definitely proven itself the most efficient means of reducing the weight and bulk of portable outfits, Tel Smith has incorporated it into this new compact, rugged, completely equipped dual portable.

FIVE CHAIN DRIVES ELIMINATED AND REPLACED BY BELT DRIVES—give smoother, quieter operation and lower up-keep.

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ALTERNATE PLANTS—The plant illustrated and described above can be furnished equipped with (as extras) alternate arrangements of bin loading conveyors, and with field conveyor with swivel head.

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# TELSMITH

## Road Maintenance In State of Utah

### State Highway District Depots Must Meet Wide Variety of Climatic and Topographic Conditions

By JOHN C. MULVILLE, District Engineer, Utah State Road Commission

THE maintenance of state highways in the state of Utah presents a wide variety of working conditions and calls for diversified equipment due to topographic and climatic changes within relatively short distances.

U. S. 40 cuts across the center of the state, entering from the east at the "K" ranch on the Colorado-Utah state line, crossing the Green River at Jensen and continuing westerly through the Uinta Basin, a fertile irrigated region depending wholly upon highways for transportation, being without railroad service of any kind. Leaving Duchesne, the westerly town of this region, the grade of U. S. 40 rises steadily to a plateau region of great beauty, passing through the Strawberry Lake section and northwesterly to the head of Daniels Canyon at an elevation of 8,000 feet. U. S. 40 then follows down Daniels Canyon, passes through the city of Heber, which lies encircled by the surrounding Wasatch Range, and then continues northwesterly through the mining country of Park City, over the Parleys Canyon Summit and thence down to Salt Lake City, with an elevation of 4,200.

#### Sections Differ Widely

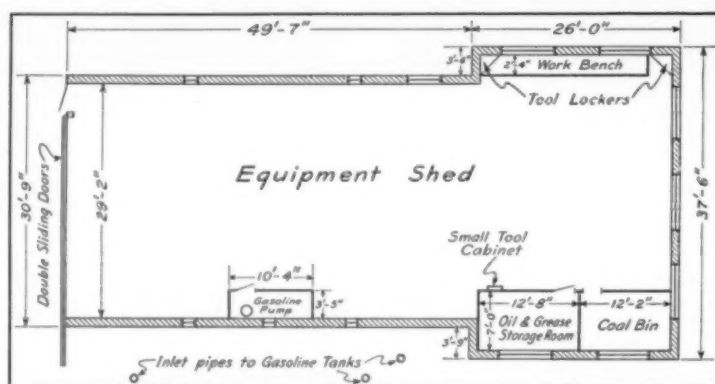
From Salt Lake City to Wendover on the Utah-Nevada line, U. S. 40 traverses a very different type of country. From Salt Lake City to Grantsville, the route is through pasture country, with milling and smelting plants built on the adjacent foothills. From Grantsville to Wendover, the route crosses the Salt Flats, famous as the world's fastest speedway.

The maintenance problems on a desert section such as that from Knolls to Wendover across the Salt Flats are far different, both in climatic conditions and equipment requirements, from a section in the plateau region served by the two maintenance depots in the Strawberry Valley.

#### The Knolls Depot

The depot in the Salt Flats desert at Knolls maintains a 40-mile section of highway on an air line between Knolls and Wendover. In the high and blazing summer noons, the heat and glare are intense. Water is hauled to the depot in tanks. In the winter, the weather is comparatively mild and, while the region is bleak and forbidding as a dwelling place, the maintenance problems are less costly than those in the scenic plateau regions.

The personnel at the Knolls Depot includes a foreman, two truck drivers and



Floor Plan of the Strawberry Valley Equipment Shed, Utah State Road Commission

two laborers. The following equipment is used at this depot: one gas-tank trailer, one camp house trailer, one Caterpillar power grader, one Caterpillar grader, one Baker snow plow, one Gettlesman snow plow, two Packard trucks and one Ford truck.

#### The Plateau Section

The plateau section, beginning at Center Canyon, 65 miles east of Salt Lake and extending easterly for 28 miles to the Wasatch-Duchesne County line, was added to the state road system in 1910 and since that time the highways have

been steadily improved. At the end of 1938, all highways were entirely hard surfaced.

The Strawberry section is maintained by two depots: one located in the main valley and the other 11 miles to the east on Soldier Creek. The buildings of both depots are of wood and steel construction and are designed to insure the comfort of the employees during the long winter season.

Winter in these high altitudes begins in October, being ushered in by heavy rains which add to the problems of the state highway department personnel by their attendant rock and mud slides. From December to May, blizzard conditions often prevail. To the maintenance men, these are a part of the regular day-and-night work, but to travelers, they are a source of bewilderment, and a large part of the maintenance workers' time is taken up in getting them out of borrow pits and back on the highway or in caring for them in the depots over night. In the early autumn, half-grown

(Concluded on page 25)

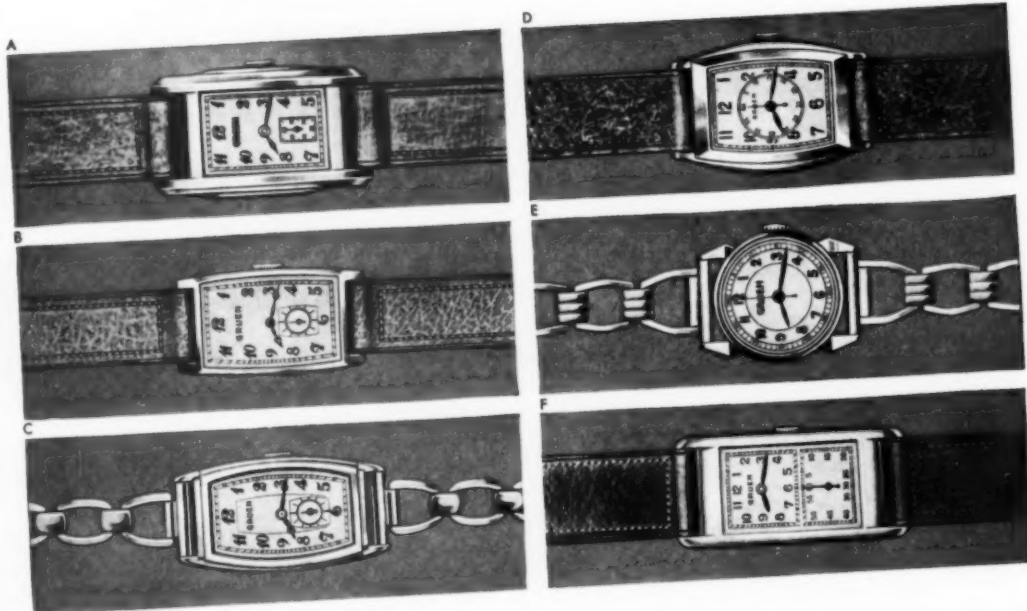
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F. OLYMPIAD, 17 jewels, yellow gold-filled case . . . \$37.50



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### New Paving Breaker

A new Cushioned-Air paving breaker, known as the CC-80, has just been announced by Ingersoll-Rand Co., 11 Broadway, New York City. It is an 80-pound machine and incorporates the most recent developments in the I-R line of paving breakers and pile drivers. The air-cushioned piston on this breaker results in an easier holding hammer, especially at higher air pressures.

Other design features include a larger anvil-block bearing to insure correct alignment; an extra large built-in lubri-

cator; reverse buttress self-locking threads on the fronthead bolts and the latch bolt of the steel retainer; and several other refinements. Complete details are contained in Form 2530.

### Tilting-Type Trailer

A tilting-type trailer, available in five sizes up to 10-tons capacity, with either standard or recessed platforms of various widths and lengths, has been announced by the Meili-Blumberg Corp., Box C-3, New Holstein, Wis. This new trailer tilts for loading and can be towed

behind a motor car, truck or tractor. A patented double drawbar permits the trailer to be tilted without uncoupling. In transit, this drawbar is securely locked. The platform serves as a loading ramp, and machines can be driven onto the trailer under their own power, or can be loaded with the aid of a hand-operated winch.

This M-B trailer is equipped with Timken-roller-bearing axles that move independently in vertical channel-shaped sliding guides. Multiple coil spring suspensions are claimed to take up road shocks and prevent side sway.

### Tractor-Drawn Crushers

Trailer-type crushers, made by the Universal Crusher Co., Cedar Rapids, Iowa, for tractors with rear power take-off, are used by contractors and highway departments for crushing hand-fed material from stockpiles or windrows along the road. The Model 258-T consists of a jaw crusher mounted on two-wheel trailer truck with drive from the tractor. Complete details are contained in Bulletin No. 11, copies of which will be sent to you by the manufacturer on request.

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*And they'll do it on a minimum amount of low-cost fuel . . . and with a minimum of replacement-parts and service!*

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See your nearest "Caterpillar" dealer. He'll help you pick machines that fit your needs with precision—and give you the fullest of a "Caterpillar" Diesel's advantages!

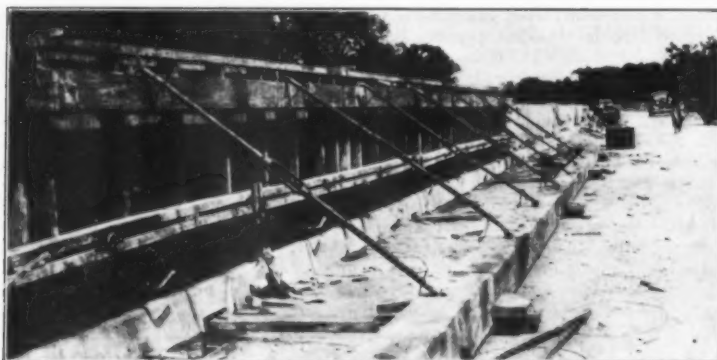
**CATERPILLAR TRACTOR CO.**  
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"Caterpillar" Diesel No. 12 Auto Patrol owned by San Joaquin County, California. It is used to maintain more than 300 miles of county roads. Works 8 hours a day. Uses only 2½ gallons of 6½-cent fuel an hour. A total daily fuel-cost of only \$1.17. The No. 12 Auto Patrol is the heaviest, most powerful motor-grader available. It has a 66-horsepower "Caterpillar" Diesel Engine . . . six forward speeds . . . almost unlimited blade-positions . . . it grades, scarifies, handles gravel and oil-mix . . . makes high bank-cuts and heavy ditch-cuts . . . and its blade can be turned completely around for working in reverse!

"Caterpillar" Diesel D6 Tractor and "Caterpillar" No. 33 Grader owned by Buena Vista Township, Rushville, Illinois. Scrapers, scarifiers, wagons, rollers, tampers and bulldozers are a few of the various pieces of equipment that can be teamed with a "Caterpillar" Diesel Tractor for road-repair and road-construction work . . . on a minimum amount of low-cost fuel, and with a minimum time-loss and expense for service and parts!

"Caterpillar" Diesel D8 Tractor pulling a "Caterpillar" No. 48 Elevating Grader to build subgrade for a new highway. It is not unusual to cast in 600 to 800 yards an hour with this "Caterpillar" Diesel equipment!

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C. S. M. Photo  
Detail of the Form Work and Bracing for Hand Ball on the Apalachicola River Bridge  
Built by the C. G. Kershaw Contracting Co.

## Steel and Concrete Work on Fla. Bridge

(Continued from page 6)

and the pile snaked around to the leads by the pile driver hoist.

The outside piles of each bent were driven with a batter of  $\frac{3}{4}$ -inch per foot and in addition the double bents were all battered 1-inch per foot. The single bents were tied with a pair of diagonal sway braces composed of  $3\frac{1}{2}$ -inch angles electrically welded to the beams and also a pair of horizontal braces 1 foot above the concrete protection jacket. At the top of each bent a 12-inch channel with the flanges turned upward was welded as a tie for the tops. The double bents carried double sway braces and horizontal braces as well as  $3\frac{1}{2}$ -foot struts, minimum length, between the bases of the piles at the tops of the jackets. These were longer for the longer piles and were inserted to brace against longitudinal movement.

The piles were received on the job without paint and given two coats of hand-brushed red lead before driving and one coat of silver gray finish paint after driving. The paint was burned off prior to welding and then retouched. All steel for the structure was hauled over the old bridge, trucked down a heavy timber ramp to the east end of the job and then lifted to the trestle by a stiff-leg derrick equipped with a Novo hoist. This was done for all except the last six bents, numbers 98 through 103, which had to await the completion of the detour bridge around that section of the work.

The welding of the sway braces and top braces was done with a Hobart electric welder mounted on a trailer and carrying as auxiliary equipment an acetylene generator at the back and a pair of oxygen cylinders mounted on the sides. A very sturdy welded towing device was built into the body of the light truck which hauled the welding trailer.

### Concrete Jackets for Piles

To protect the steel piles at the usual water elevations in the bottomland, concrete jackets were specified from 2 feet below ground level to 3 feet above. The jackets are 18 inches square and reinforced with No. 9 gage wire mesh placed  $1\frac{1}{2}$  inches from the face of the jacket. When pouring these jackets under water, the contractor used a wood bottom of 1-inch plank worked down to the bottom elevation of the wood form after which the form was set and the concrete poured through a 4 x 6-inch tremie which fitted in the flange of the pile and was fed with the concrete through a side hopper just large enough for easy shoveling. The bottom of the tremie was fitted with a trap door controlled by a cable, and a second cable was used to swing the tremie itself. This worked well in water, allowing the weight of the concrete to open the tremie door and the cable to close it. At times it was necessary to work in 2

feet of mud and the same device would not work without getting streaks of mud into the concrete. The contractor overcame this easily by using a 4-inch suction pump inside the forms and also by cutting a 4 x 6-inch window in two sides of the jacket forms at the top level of the

water. Thus when the concrete was poured the small amount of mud left in the forms flowed out readily at water level under no head, leaving the space for the concrete clean.

### Caps and Stringers

On each single bent a reinforced concrete cap 25 feet long was poured with the piling extending 12 inches into the cap. These caps were 2 feet 6 inches high, minimum, and measured 2 feet 6 inches wide. The variation in height was due to the superelevation of the long curve, all of which was taken up in the height of the caps. A 3 x 2-inch chamfer on all four corners and a 2-inch radius fillet uniformly 1 foot 6 inches from the bottom of the cap gave an attractive finish to the concrete work. The reinforcing consisted of eight 1-inch round bars, two at the bottom corners, two just above the top of the piling and four at the top of the cap, all surrounded by a stirrup to which all but the two center rods were tied.

Three sets of forms lined with  $\frac{1}{4}$ -inch

Masonite were made for the caps and these were used to pour the entire 103 caps for the structure, or over thirty pours each.

Four 27-inch I-beam stringers weighing 90 pounds per foot were used to carry the deck. The stringers are fixed on the odd-number bents and have slotted holes on even-number bents with  $1\frac{1}{2}$ -inch swedged anchor bolts and  $1\frac{1}{2}$ -

(Continued on next page)

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## Unusual Deck Forms For H-Beam Bridge

(Continued from preceding page)

inch bearing plates on all bents. The stringers were placed by the A-frame derrick with the 40-hp Novo hoist, using 4-inch pipe rollers to move the derrick forward over the stringers already placed. When it came time to paint the stringers after the deck was poured there was very little cleaning needed as the deck forms were tight and the concrete quite dry. To facilitate the work, an ingenious scaffold rig was devised by the contractor and made up by the skilled welder who also manufactured blocks from steel plates and many other devices as required right on the job instead of waiting until an order could be placed and the necessary accessory delivered from the company's own yard or from the stock of the nearest distributor. For the scaffold rig two pairs of roller-skate wheels were mounted at the top of a pair of iron straps bent by welding to form a Y when bolted together. These wheels ran on the lower flanges of the I-beam stringers and supported the plank scaffold timber. When the end of one span was reached the extra set of scaffold supports was rigged on the next span and the last set dismantled for use on the next span ahead.

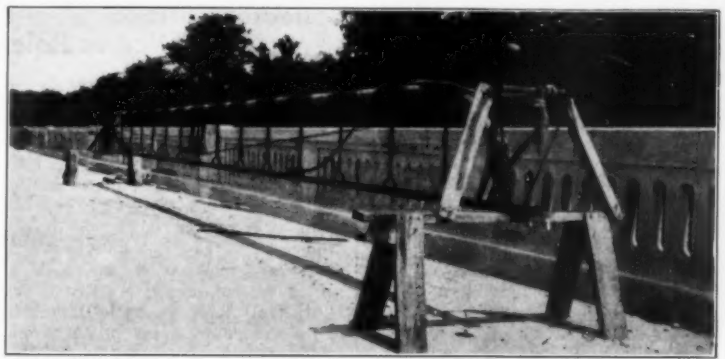
### Deck Forms

The structure carries a 7½-inch reinforced concrete deck and the ends of each set of stringers is encased in a 9-inch web wall with a 1-inch open expansion joint between on alternate bents. At the other bents the slab is separated by a single-ply roofing felt. The deck is cantilevered 2 feet 10 inches from the outside beam with the web wall being carried out at the ends as a bracket. The brackets were reinforced with a 1-inch truss rod carried through the stringers and up into the curb. Three 4-inch cast iron scuppers were set in the deck in recesses in the curb on each side in each span. The deck carries a curb 9 inches high with a 1-inch batter and 1 foot 4 inches wide on which the concrete hand rail and end posts are mounted.

The deck forms consisted of panels of ¾-inch tongue and groove face lumber and seven 2 x 6's which fitted between the stringers, measuring 7 x 9 feet and four to a span. For the distance between the stringers they were supported at the proper height by jacks built up of 2 x 4's and wedged firmly against the stringers. These were set at 18-inch centers.

A real novelty was met in the method of holding the forms for the over-hung section outside the stringers. Wooden trusses 12 feet long were made of 1 x 6-inch lumber as a simple triangle with a center post consisting of a ½-inch bolt. These were placed inverted beneath the two outside stringers and extended for the full distance of the overhang beyond the outer stringer. At the outer flange of the outer stringer the truss was clamped to the flange by a block of 4 x 6 and a ⅞-inch bolt. The inner stringer took the upward thrust of the truss when loaded. Fourteen of these trusses were used to support the jacks for the outer or overhang section of the deck in each span.

In order to insure the proper space for the open expansion joints at alternate bents the contractor cut a ¼-inch steel plate to crown and capped it with a 1-inch angle and ran ¾-inch rods through the flanges of the angle to butt against the slab already poured. This acted as a non-compressible spacer for the expansion joint and was easily re-



C. & E. M. Photo  
Sturdy, Not Too Heavy, and Readily Adjustable Is This 40-Foot Soreed for the Deck

moved when the forms were stripped.

### Adjustable Soreed for Deck

Again we have found a contractor who wants to do away with the old rough bridge builder's deck and used a screed that was adjustable to ⅞ inch and not too heavy for effective longitudinal

screeding. The screed proper was a 4-inch channel with the flanges turned upward and connected with a 4-inch pipe which formed the supporting truss. Adjusting rods of ¾-inch round rods on 30-inch centers and split neatly by the contractor's welder so that the two parts

(Continued on page 38)

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A Yaun Basket-Type Dragline Bucket

### Shell or Open-Type All-Welded Buckets

Features of the dragline buckets of both the shell and skeleton or basket types, made by the Yaun Dragline Buckets & Mfg. Plant, P. O. Box 39, Baton Rouge, La., include the patented lip which extends from the top of the bucket on one side completely around the bucket to the top of the other side. This lip is beveled, hard-faced with Stellite, and guaranteed to remain sharp during the life of the bucket. The arch of these buckets is constructed of angle irons back to back for extra strength. The construction of the lip with the arch tied into it provides a light but strong front end. Both types of buckets are of all-welded construction.

On the shell-type of bucket, the patented runners extend from the back of the lip to the reinforcing bar across the top or back of the bucket, to provide extra strength. Both of these buckets are designed for heavy-duty service and have been used on many levee jobs.

The basket-type bucket is a duplicate of the shell type, except that the patented body is formed by a series of heavy flat bars which form a basket or skeleton. This makes the bucket lighter in weight and has the advantage, according to the manufacturer, that when the work is in the wet, the material placed on the fill has lost some of the free water and therefore will dry more quickly with less chance of a soggy foundation. The manufacturer also claims that dirt does not spill through the openings.

A four-page folder describing and illustrating Yaun dragline buckets of both types may be secured direct from the manufacturer or from this magazine.

### New Well Drill

The Loomis K-2 Clipper drill for well and blast-hole drilling, recently announced by the Loomis Machine Co., Tiffin, Ohio, is a one-man spudder well drill using steel wire lines. The unit has an all-steel electric-welded frame, a chain-driven bull reel with take-up for wear, independent brake control on the bull reel, large crown pulleys on oil-less bearings, and rugged adjustable chains. The one-piece all-steel mast is electric welded and has a safe working load of 3 tons. The height from the bottom to the center of the crown pulley is 30 feet and it extends 8 feet 9 inches beyond the drilling end of the machine when lowered. Wire line braces are used to secure the mast in position and it is raised and lowered quickly by a worm-gear hand hoist. The crown sheave is of cast steel 18 inches in diameter with oil-less bushings. The sand line pulley is also of cast steel 11 inches in diameter.

Power is furnished by a 16-hp 4-cylinder air-cooled gasoline engine, with speeds ranging from 1,200 to 2,600 rpm. The oiling system is self-contained, all parts being automatically lubricated.

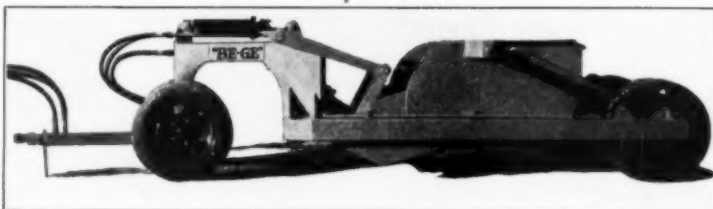
Complete information on the K-2 Clipper drill is contained in a new bulletin, copies of which may be secured direct from the manufacturer by mentioning this item.

### Reflector Buttons Installed in Poles

There are a great many roads, particularly in county highway systems, which need to be made visible, or at least identified, to the night motorist. Several utilities companies have made use of Peerless crystal reflector buttons for this purpose along turnpikes where no highway lighting has been installed.

The cost of these installations is comparatively small, 6½ cents each installed on the wooden poles, and they return real dividends to the community in reducing the number of automobile accidents and their accompanying loss of life. The reflector buttons are very easily installed. A No. 17 bit is used to drill a 1-inch hole in the pole for the installation of the No. 1-A button, or a No. 14 bit to drill a ¾-inch deep hole for the No. 2-A button.

Peerless Manufacturing Corp., Louisville, Ky., will be glad to send a copy of its Bulletin 35 describing these installations and giving prices.



A New Dirt-Moving Scraper

### New Scraper Wagons

Be Ge carrier scrapers, made by the Be Ge Mfg. Co., Gilroy, Calif., are available in 3, 4, 6 and 8-cubic yards sizes and are designed for easy and accurate control of cutting, spreading, floating and finish grading. The construction of the unit is simple, with few moving parts, and the scraper loads with a low drawbar pull, due to the direct line of pull and the low position of the bucket when loading, according to the manufacturer.

These scrapers are operated with the Be Ge hydraulic power unit, built for

long life and positive operation. Some of the features of these power units are nitralloy gears, recessed wear plates, large double row ball bearings, and hydraulically balanced control valve.

Literature describing and illustrating Be Ge scraper wagons may be secured by those interested direct from the manufacturer by mentioning this item.

More than 10,000,000 cubic yards of sand and gravel have been taken out of the pit at Grand Coulee. More than 10,000,000 tons of it were already in the dam when the job was not yet half done.

# This is what a "LITTLEFORD" user said...



**Andresen Corporation**  
ASPHALTS AND ROAD OILS  
**Tuffalt**  
For Roads  
ROAD SURFACING SPECIALISTS  
P. O., Niles Center, Illinois



*Landing up the fleet of Distributors — at the Andresen Plant.*

June 21, 1938.

*Here are the Littleford Distributors lined up for action.*

**WHY is the Littleford Distributor becoming the leader in the field?** The answer is simple. Littleford Distributors have been designed by Littleford Bros. to operate in the simplest manner, yet do a more efficient job in applying materials used in the building or maintaining of black top roads.

Compare the Littleford Pressure Distributor feature for feature with other distributors; see for yourself why users praise this unit.

**LITTLEFORD BROS.**  
405 E. Pearl St. Cincinnati, O.

Littleford Bros.,  
445 East Pearl St.,  
Cincinnati, Ohio.

Gentlemen:

Enclosed please find confirmation of order placed with you today for a Littleford Pressure Distributor Model "C".

This will be our sixth Littleford machine now in operation and we wish to comment on the excellent results we have had with these units. We find them efficient in operation and easy to handle no matter how large or small the job may be.

Attached are some photographs of the Littleford Distributors in operation on the Monroe Street parking space, Grant Park, Chicago, Ill. Work in question involved the application of 76,922 gallons of materials.

Very truly yours,  
**ANDRESEN CORPORATION**  
*Edward W. Andresen*  
Edward W. Andresen



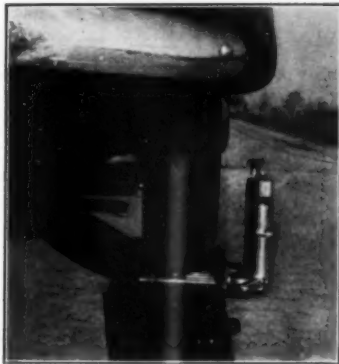
**LITTLEFORD**

BLACK TOP ROAD MAINTENANCE EQUIPMENT  
**LB**  
SINCE 1900

ASPHALTIC ROAD MATERIALS IN ALL FORMS  
WE DELIVER UNMIXEDLY OR MIXED WITH CEMENT, AND USE HOT OR COLD OILS. TANKS ARE IN STOCK. DELIVERY GUARANTEED. WRITE FOR LITERATURE.

*One Littleford Model "C" Distributor putting down an even coat of asphalt with a 12 foot spray bar.*





The Black &amp; Decker Loadometer

### New Portable Scale For Loads on Roads

As the volume of motorized transportation continues to increase and subjects the nation's highways to greater wear, and tear, the enforcement of load-limit regulations by highway officials becomes increasingly important. The new Hi-Way Loadometer, made by Black & Decker Mfg. Co., Towson, Md., is designed to provide an accurate and portable unit for use by highway patrols in checking the weights of loaded trucks.

The latest models of Loadometers have a number of features, including a guaranteed accuracy within 1 per cent; rugged construction of all parts subject to wear; complete portability and easy handling; and 100 per cent mechanical weighing principle, with an automatic recording mechanism. The unit weighs 82 pounds, is 20 inches long, 18 1/4 inches wide and 17 inches high, and has a platform area of 9 1/2 x 18 1/2 inches.

The complete highway patrol unit consists, in addition to the Loadometer itself, of two laminated hardwood ramps to facilitate driving on and off the Loadometer platform, and a substantial carrying case, with handles, which holds the Loadometer and ramps. These have been used effectively in load studies in connection with the current state highway planning surveys. Further information on this unit is contained in Bulletin 5500, copies of which may be secured direct from the manufacturer, or from this magazine.

### Improved Vibrating Screens

The most recent improvements in the line of Diamond roller-bearing vibrator screens are described and illustrated in literature recently issued by the Diamond Iron Works, Inc., Minneapolis, Minn. These screens are available in a number of models, in single, double or triple-deck types. A feature of the screens is the use of Diamahr metal in their manufacture. This metal is a processed and controlled specification iron which is characterized by strength, toughness, heat resistance, and resistance to abrasion.

Copies of Bulletin D-37-B describing

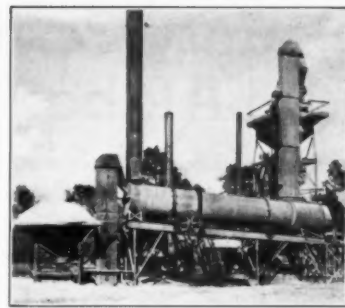
and illustrating Diamond roller-bearing vibrator screens, as well as a folder giving more complete information on the Diamahr metal used in Diamond products, may be secured direct from the manufacturer by mentioning this item.

### Diesel Power Used In Asphalt Plants

Sixteen large-capacity portable asphalt plants are used by Sam E. Finley, road-building contractor of Atlanta, Ga., to provide hot mix for his many road jobs in the southeast and recently he has equipped the plants for diesel operation. The plant illustrated has a capacity of 100 tons an hour and was used last season to provide mix for State Route 1 between Bainbridge and Colquitt in southwestern Georgia. The hot-sand elevator, vibrating screen, rotary drum, 5 1/2 x 5 air compressor and deep-well pump are operated by an International Model PD-80 6-cylinder diesel engine while an International PD-40 4-cylinder diesel furnishes power

for the rotating sand-drying drum and horizontal sand conveyor under the hopper and the elevator for raising sand to the drum.

Two types of mix were used for this job. One was for 3-inch base and consisted of 7 per cent asphalt and 93 per cent sand, which was taken from a nearby pit. The other mix for the 2-inch sheet top consisted of 9.5 to 10 per cent asphalt, 10 per cent mineral filler, and 80 per cent sand. The sand was delivered by clamshell to the hopper which has a capacity of 30 tons. A moving platform below the hopper conveyed the sand to the sand elevator and thence to the drying drum. This rotating drum is 42 feet long and has an inside diameter of 90 inches, with blades inside continually agitating the sand. Heat is provided by two oil burners. From this drum the sand passed to the vibrating screen and then was elevated, according to size, to a multiple-compartment storage bin. After being weighed, the sand was delivered as needed into an 8-ton mixing drum. Asphalt was stored in



A Portable Diesel-Powered Asphalt Mixing Plant Owned by Sam E. Finley On Location Near Bainbridge, Ga.

three tanks of 10,000-gallon capacity each and was taken from there for heating in a 1,000-gallon steam jacketed kettle.

It is reported that one of these large plants is frequently knocked down, moved to a new job as much as 100 miles away, set up and put in operation again in less than two weeks.

## FACTS

**TESTED AND PROVED**—The pioneer of minimum weight excavators, featuring the time-proved Center Drive design in turntable, crawler and shovel boom.

**BALANCED DESIGN**—Patented sloping machinery frame concentrates weight where it develops the maximum capacities at minimum weight.

**SIMPLICITY**—A compact, accessible design whose fewer parts are huskier, stronger.

**CONCENTRATED POWER**—A direct-to-the-point application of power, which can be concentrated all on one operation or spread over simultaneous operations. Gas, Diesel or electric.

**MOBILITY**—Two Crawler speeds (and steering) in either direction. 30" wide treads available for minimum ground pressures. Fast loading, single-purpose trailers for long distance moves.

**VERSATILITY**—Easily convertible, and equally efficient, as crane, dragline, clamshell, shovel, back-digger, skimmer scoop.

## AND FIGURES

**97.64 YARDS PER HOUR—**

that's the average output of 3/4 yd. Lorain shovels and draglines, as reported by owners on 53 different jobs in all parts of the country.

In other words, the 3/4 yd. Lorain is designed for digging more material, faster, at lower cost—and does it! Write today for catalog describing this profit-proved 3/4 yd. machine.

UNIVERSAL CRANE DIVISION  
THE THEW SHOVEL COMPANY  
LORAIN, OHIO



# 3/4 YD LORAIN 40A

### CONCRETE VIBRATORS

(Gas and Electric)

Concrete Surfacing Attachments



Master Vibrator Company, Dayton, Ohio  
DISTRIBUTORS IN ALL PRINCIPAL CITIES

## Beauty Pays Dividends On Alabama Road Jobs

**When Roadside Development Is Made to Cut the Costs Of Maintenance by Checking Erosion of Ditches**

★ THE Alabama State Highway Department has started several roadside development projects, two of which, in the Birmingham area, are referred to in this article. Garden clubs and landscape architects who would beautify our roadsides for the sake of beauty alone must realize that, as much as the modern mechanized individual needs a greater opportunity to delight in the charms of nature, with the finances of our highway departments as they are today due to the diversion of funds for political expediency, we simply haven't the money for beauty that does not pay dividends. On the other hand, if the means of reducing maintenance costs can be found in a project that will cut 1 to 1 slopes back to 4 to 1, and provide wider and flatter ditches, both of which can be grassed, and which are more natural and much more pleasing to the eye, then by all means let us have beauty. Flatter slopes, particularly if they are grassed, do not erode as rapidly and carry dirt into the ditches to be removed by the maintenance crews.

On the Birmingham-Bessemer Road, a four-lane divided highway, the Alabama Highway Department in conjunction with WPA has done some fine work which we are happy to describe in some detail and illustrate in *CONTRACTORS AND ENGINEERS MONTHLY* for the benefit of construction and maintenance men, not to forget the B. E. (Beautification Engineer). This FAP 57 consists of a boulevard strip 20 feet wide in the center with a 20-foot pavement on either side, 2-foot 6-inch shoulders, a ditch, and a slag walk for pedestrians on the outside.

### Ditch Checks and Surface Ditches

Where there was bound to be some wash in the roadway ditches at pipe inlets, due to the gathering of a large volume of water, the edge of the inlets was raised about one foot to act as a ditch check at the edge of the brick and concrete inlet. Strip sodding was also used across the ditches at intervals to act as checks. These strips were 14 inches wide and spaced 14 inches apart.

On this project the surface ditches were placed at the top of the slope, thus keeping all of the water from above off the slope. On a project north of Birmingham where there was an unusually high sidehill cut the State did something that on first sight had a slightly humorous appearance and faintly suggested a "roller coaster." The surface drain, instead of coming straight down the end

of the face of the cut, meandered down with the turns paved with native rock and the slopes sodded. The slopes away from the face of the cut were on a slope of 1 per cent and toward the road on a slope of 0.5 per cent. Examination of these surface drains showed that they were operating to advantage as the scour was all at the turns where the paving protected the soil from erosion and through the sodded section there was some deposit of soil.

### Boulevard Strip Source of Trouble

When a construction engineer designs a divided highway with a grass plot through the center, he dismisses it then and there as a safety measure which also may be a sop to the roadside development crowd. But he still has the



C. & E. M. Photo

A "Roller Coaster" Surface Drain on a Sidehill Cut

maintenance men to contend with. For example, on the Birmingham-Bessemer project, the center strip after comple-

tion proved to be a source of trouble as it took up a large amount of water and permitted it to run down under the surface of the pavement, weakening the subgrade on which the stability of any pavement depends. It was not a roadside development feature that corrected this trouble but it is of interest how they got around the difficulty.

This trouble developed along the side of the center grass plot on a long down grade. A ditch 12 inches wide and 16 inches deep was dug between the road and the parkway and filled for the bottom 8 inches with 2½ to 1-inch slag, then covered with 4 inches of 1 to ½-inch slag and topped with ½ to ¼-inch slag. This was then sealed with clay or bitumen. From this drain an 8-inch tile drain with sealed joints was laid across the road and the water taken to the road ditch. This type of drain does what a curb would not do. If a curb had been placed at the sides of the parkway strip it would have merely caused the water to go deeper before entering the sub-

(Concluded on page 42)

## IT'S A *Tough* LIFE



**BUT A-W BLADE GRADERS DON'T weaken!**

● Enthusiastic reports from owners and operators in every section of the country testify to the strength, capacity, ease of control and long life of A-W Blade Graders! All are equipped with rugged, durable frames that withstand every shock and twist of the worst going . . . large diameter circles for widespread, rigid support of blades . . . moldboards of proper weight and curvature . . . fast operating mechanism (both manual and hydraulic control) that functions smoothly and easily.

Ask us to show you the distinctive A-W Blade Grader features—developed during more than 60 years of grader building experience—that provide a combination of time-saving, cost-reducing and maintenance-eliminating performance obtainable with no other road grader.

**The AUSTIN-WESTERN ROAD MACHINERY CO., Aurora, Illinois**

Motor Graders  
Roll-A-Planes  
Rollers  
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Crushing and  
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Blade Graders

Motor Sweepers  
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Bituminous Distributors  
Elevating Graders

5-Yard Tractor-Scraper  
6-Yard Tractor-Scraper  
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12-Yard Hydraulic Scraper

## RENT a New "Simplified" ARC WELDER



No labor lost, no expensive replacement parts. Make repairs right on the job . . . use the economical new welded construction.  
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**HOBART WELDERS**

The Fastest Selling Welders on the Market Today.

Repair Equipment on the job  
Get Low Cost Construction  
Build Steel Forms Economically





C. & E. M. Photo  
A Sheet of Metal in the Spreader Box  
Kept the Mix in One Corner To Be Spread  
on the 3-Foot Widening Strip

## Pit-Mixed Material For Road Widening

(Continued from page 1)

narrow, has far too many curves for the safety of motorists. This 40 miles of highway was made safer last summer by the addition of 3-foot bituminous shoulders on either side. Penetration macadam was considered but the cost would have been about \$3,000 per mile of road while the pit-mixed material was placed at \$1,000 to \$1,200 per mile.

### Preparation at Pit

To reduce the haul on such a long job, the state highway maintenance forces selected three gravel pits in which to prepare the gravel and sand for the shoulders. The first pit was at Middlesex near the Montpelier end of the job where state-owned equipment excavated, crushed, screened and mixed the materials. At the second location a commercial pit was used and the materials purchased delivered to state or rented trucks. This pit was between Jonesville and Richmond about 18 miles from Burlington. The third pit was close to Burlington.

At Middlesex, pit-run gravel, crushed as required, was used for the mixture of 50-50 sand and stone up to 1½-inch screen size. The state maintenance crew, in charge of E. M. Sargent, Foreman, ran the two ½-yard Lorain shovels which handled the excavation and mixing of the aggregates.

At the commercial pit between Richmond and Jonesville, the prepared aggregates were stockpiled about 15 feet high so as to be easily accessible to the Koehring ¾-yard shovel for the mixing operations. The Durfee method of mixing was used. It was developed by Elton F. Durfee, City Engineer and Commissioner of Public Works, Cranston, R. I. The shovel first made a small conical pile of the aggregates, about six to eight dipperfuls. Then the blended tar was sprayed on at a rate that provided about 16 gallons of tar per cubic yard of gravel, as the shovel continued to drop dippers of aggregate on the apex of the conical pile so that the material spread out uniformly over the entire surface of the pile. The tar was applied by pumping from the 835-gallon Koppers tank truck through a flexible hose to a 27-foot pipe 1½ inches in diameter equipped with a frame for manipulating it at one end and a pair of Spraco nozzles on a 3-foot cross header at the far end. The pipe was mounted on a frame about 5 feet high in an oar lock so that the man operating it could swing the spray over the increasingly large pile of material quite readily.

After this conical pile had reached

the proportions to absorb the entire tank load of tar, the Koehring shovel began mixing by picking up dipperfuls and dropping them as it swung toward the storage pile of the mixed material. This thoroughly mixed material was then loaded into the state trucks with a Universal Unit 310 shovel with a ¾-yard dipper owned by a local truckman, W. C. Kirby. The truck bodies were oiled with sprinkling pots before loading for each trip. This was done by two men and there was also a checker for the pit owners and one man with a hand shovel who spread the material level in the truck bodies before they pulled out from the pit.

The tar was furnished by the Koppers plant in Everett, Mass., and shipped by tank cars to Richmond, Vt., from which it was transhipped by the tank truck to the various pits. The outfits mixed about 250 yards per day.

### Spreading the Shoulders

Each of the eleven trucks used for  
(Concluded on page 25)

## South Bend

**BITUMINOUS DISTRIBUTORS**

**MAINTENANCE UNITS**  
*For Bituminous Surfaces*

**STREET FLUSHERS - STREET SPRINKLERS**

**GUTTER SNIPE**  
*Pickup Sweepers*

**TRAFFIC LINE MARKERS**

**MUNICIPAL SUPPLY COMPANY**  
**SOUTH BEND, INDIANA**

**31**  
YEARS  
EXPERIENCE



Universal 18"x36" Portable Roller  
Bearing Crusher produces road materials  
at the lowest cost for this  
Pennsylvania operator.

Below: Keeping the 21-yard bin full  
is "duck soup" for this Universal Deal  
Crushing Plant — one of 50  
Universal types.

## HOW TO MAKE CRUSHED STONE AT THE LOWEST COST!

Get a Universal Crusher or Plant — there's a size and type for every need — and put it to work for you. It will give you higher production without even crowding; the crusher's wide feed openings and the force feed, double-action stroke delivered at every revolution take care of that.

You'll grind out more tons a day and you'll save from a nickel to a half-dollar on every ton figured over a fiscal period. These savings result from faster output, more uniform crushing, less rejects, and lower operating and maintenance costs. Why take our word for it — ask to see user reports and names of users in your vicinity.

Write for bulletins on Universal Bronze and Roller Bearing Crushers; Crusher-Pulverizer Combinations; Stationary, Portable and Semi-Portable Crushing, Screening and Loading and Washing Plants.



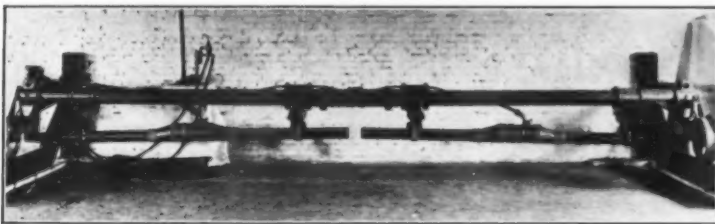
Below: "It's like grinding coffee" with a Universal Pulverizer — look at that "man-size" stone going in and the "fine" fines coming out and almost as fast as sliding it right into the truck.



**UNIVERSAL CRUSHER COMPANY**

620 C Avenue West, Cedar Rapids, Iowa

# UNIVERSAL



Front View of the Jackson Model PT-100A Vibratory Paving Tube

### New Vibrating Tube For Concrete Paving

The new Jackson heavy-duty vibrating paving tube, recently announced by Jackson Vibrators, Inc., Ludington, Mich., embodies developments in design and construction which enable contractors and engineers to use lower water-cement ratios, harsher mixes, and dual drum pavers to more complete advantage, according to the manufacturer.

The complete paving tube assembly is carried independently of the finisher, on two flanged wheels, and may be used in conjunction with any type or make of finisher by attaching two push rod brackets. No permanent attachments to the finishing machine are necessary, aside from a base for the electrical power unit and the small hydraulic pump lever used in raising and lowering the tube. When it is necessary to raise the tube, the vibratory motors are automatically stopped when the tube reaches a predetermined height and are automatically started as the tube is lowered into the concrete.

Power for the operation of the twin tubes is supplied by a 5-kva 3-phase 60-cycle 110-volt totally enclosed power unit which operates normally at 1,250 rpm and is directly connected to a LeRoi 4-cylinder 10 to 12-hp engine. The plant has an ample reserve of power and may be used for operating floodlights for after-dark work and for any type of portable electric tools.

The Model PT-100A, shown in the illustration, has duplicate 10-foot tubes on which the vibratory motors are mounted as an integral part of the unit. A 24-inch flanged center section of the carrying frame is removable, permitting a standard vibrator to be attached to either an 18 or 20-foot finisher. An extension for a 22-foot is available.

Jackson vibratory tubes for concrete pavement are fully described and their various features illustrated in a booklet which may be secured direct from the manufacturer by mentioning this item, or from this magazine.

### Electric Screed Heater For Black-Top Pavers

A new electric screed heater has been announced by the Foote Co., Inc., Nunda, N. Y., for use with its Adnun black-top pavers. A bank of three strip heaters, mounted in the screed, make up the heater unit. Current is

supplied by a 3-kw 125-volt dc generator mounted on the deck of the paver and connected to the shaft at right angles to the motor. Positive control is obtained by a rheostat, placed within easy reach of the operator. This heater, it is claimed, will maintain even heat over the entire length of the screed and for long runs.

These heaters may be installed in pavers already in the field easily and economically. Complete information may be secured direct from the manufacturer.

### Highway Posts of All Types

Sweet's steel posts for highway signs, guard rail and snow fence are described and illustrated by photographs and diagrams in literature issued by Sweet's Steel Co., 100 Sweet St., Williamsport, Penna. Features of these posts are their rail-steel strength, durability, high section modulus, wide bearing surface, flanged channels providing maximum ground stability, and self-anchoring without ground plates. Copies of the bulletin describing these posts may be secured by state and county highway engineers direct from the manufacturer by mentioning this magazine.

### Hand Paving Tools

The line of L & M hand tools for use in concrete paving, including the Giant-gripT straight-edge of either steel or aluminum, hand floats, finish floats, longitudinal floats and concrete brooms, is described in literature which interested contractors and engineers may secure

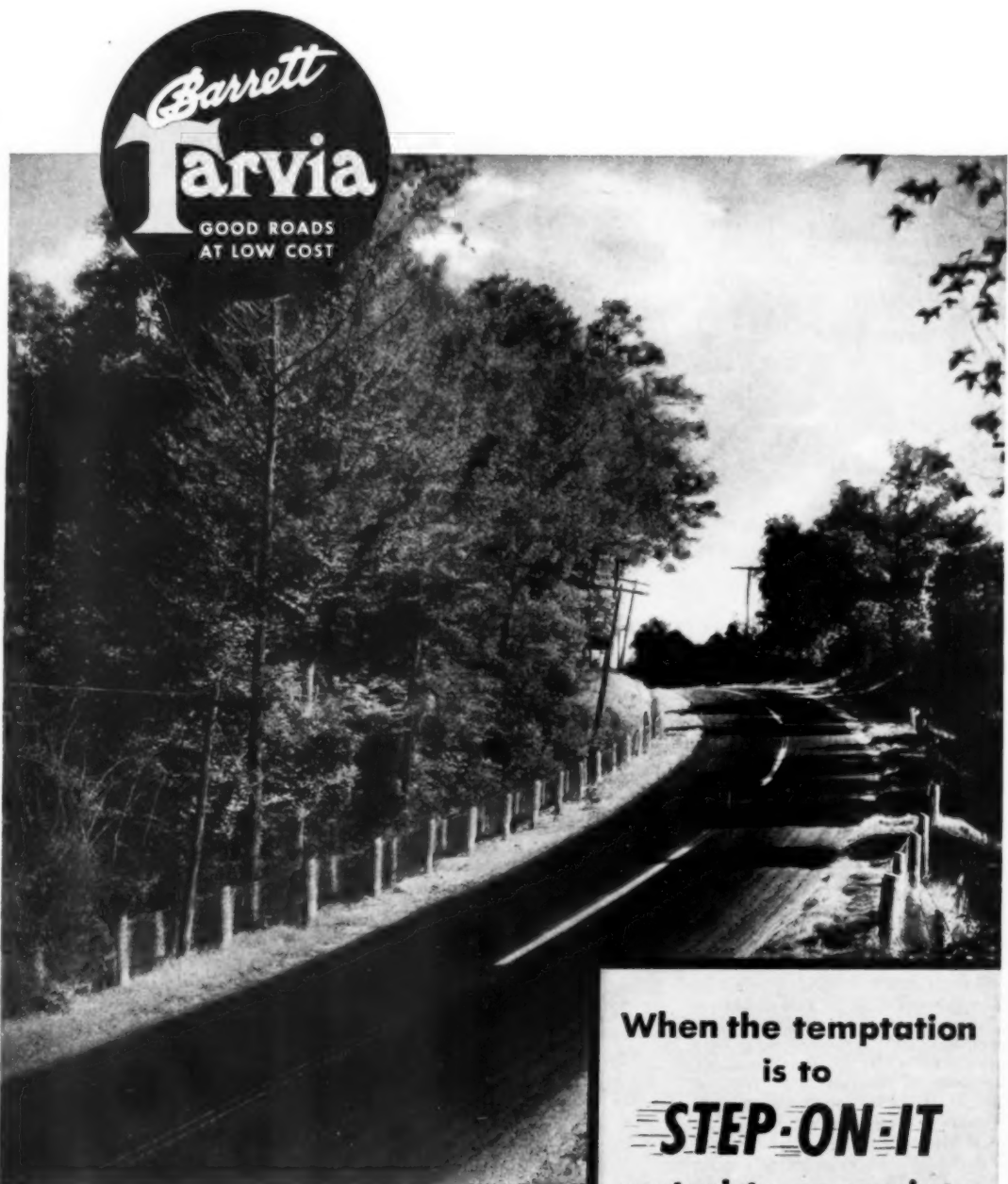
direct from the L & M Mfg. Co., 10302 Berea Road, Cleveland, Ohio. The straight-edges, hand and longitudinal floats are available in a variety of sizes and styles, to suit all requirements, and are designed for durability and accuracy. The brooms, which may be had in bass or bassine fibre, are also made in several sizes and styles and conform to specifications of states where concrete brooming is required.

### WILLIAMS FORM CLAMPS High Tensile Tie Rods

It costs 6¢ per cu. yd. of concrete for rod replacement in using Williams Clamps on a form design of 600 lbs. pressure per sq. ft.

- Service (24 hr.) phone 3-3823
- Send plans. Tie figured gratis
- Special Form Designing Service
- Sale-Rental-Trade Allowances
- Specifications (most rigid complied with)

**Williams Form Engineering Corp.**  
Box 925, Madison Square Sta.  
Grand Rapids, Mich.



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New York Chicago Birmingham St. Louis Detroit Philadelphia Boston  
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America's leading manufacturer of coal-tar products  
**ROOFINGS • TARVIA • CHEMICALS**

When the temptation  
is to  
**STEP-ON-IT**  
motorists appreciate  
**"TRACTIONIZED"**  
Skid-Safe Tarvia  
Pavement

### CUMMER Asphalt Plants

All styles and sizes  
for  
HOT or COLD Mix

### Heavy-Duty Mixers

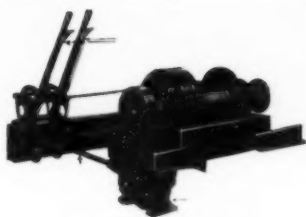
45 Years' Experience

THE F. D. CUMMER  
& SON CO.

17th and Euclid Ave.  
Cleveland, Ohio

Write for  
literature





The Ramsey Truck Hoist

### Truck-Hoists

One of the features of the Ramsey all-steel truck hoist, in single or double-drum models, is the patented friction clutch in the drum which not only provides overload protection but also makes it possible to raise or lower loads smoothly and safely at any reasonable line speed, according to the manufacturer, the Ramsey Machinery Co., 1626 N. W. Thurman St., Portland, Ore. It is claimed that no friction is created by the actuation of the drum clutch as the pressure from the contracting band is imposed on a stationary bearing. When the clutch and drum brakes are fully released, the drum automatically unwinds at a slow line speed. No reversing gears are used.

As the drum shaft of the hoist is at a 90-degree angle to the power take-off drive shaft, an angle gear drive is necessary. Some trucks have the power take-off opening on the right side and others on the left and the direction of rotation of the power take-off gear also varies. Another feature of the Ramsey hoist is the bevel gear reducer which is secured to the under side of the hoist frame, at either the left or right side, and can be turned top for bottom to get the desired direction of gear rotation. Thus, this hoist can be mounted on any make of truck, and can be changed from one make to another without rebuilding the hoist.

The drum capacity of this hoist is 400 feet of  $\frac{1}{2}$ -inch wire rope. The single line hoisting capacities are 10,000 pounds with the bare drum and 4,000 pounds with the full drum. The single-drum unit weighs 400 pounds and the double-drum 800 pounds. Further information on these hoists is contained in literature which may be secured direct from the manufacturer.

### Asphalt Institute Opens Office in Washington, D. C.

Announcement has been made by The Asphalt Institute, New York City, of the establishment of a district engineering office in the Transportation Building, Washington, D. C. Major Walter R. Macatee, District Engineer at Cincinnati, Ohio, has been promoted to the post at Washington.

The purpose of the Washington office is to bring to the scientific departments of government the full cooperation of the asphalt industry in working out the problems of bituminous construction for highways and airports, as well as flood

control and harbor protection mats and jetties.

Albert H. Hinkle of Louisville, Ky., formerly Director of the Kentucky Rock Asphalt Institute, has been appointed District Engineer for the Institute at Cincinnati, Ohio, to succeed Major Macatee.

### Federal Enters Field Of Light-Duty Trucks

The announcement of two new  $\frac{3}{4}$ -ton models marks the entry of the Federal Motor Truck Co., Detroit, Mich., into the low-price light-duty field. A choice of a 4 or 6-cylinder engine is offered for the standard chassis. Model 7 is built with a 4-cylinder engine having 3  $\frac{3}{16}$ -inch bore and 4  $\frac{3}{8}$ -inch stroke and developing 52 horsepower, while Model 8 is powered by a 6-cylinder 7-bearing engine with 3  $\frac{1}{4}$ -inch bore and 4  $\frac{1}{8}$ -inch stroke, developing 65 horsepower.

Except for the difference in engines, both models are identical in design and

construction. Extra sturdy construction is designed to give long life and low upkeep cost, according to the manufacturer. Four wheelbase lengths of 102,

111, 119 and 128 inches and five standard bodies in various lengths to meet a wide range of requirements are available.

## MORE MIXER

## FOR YOUR MONEY!

You get a bigger dollar's worth for every dollar you spend on this Rex 10-S—it's huskier, better engineered, built to stand up over the long, hard run! Rex alone gives you all these points:

Rex vertical "dribble-free" water tank; Rex shimmy skip; Rex motor-mounted "above the dirt line"; Rex outside-pivoted discharge chute; Rex pressed steel drum-heads and Timken-equipped drum rollers.

After you've looked at them all and you still want the best—buy Rex and be right! Send for new 1939 catalog!

**CHAIN BELT COMPANY**  
1679 W. Bruce St., Milwaukee, Wis.

**REX**

## MIXERS



# This job MARCHES ON

at an Hourly Fuel Cost of Only 36c

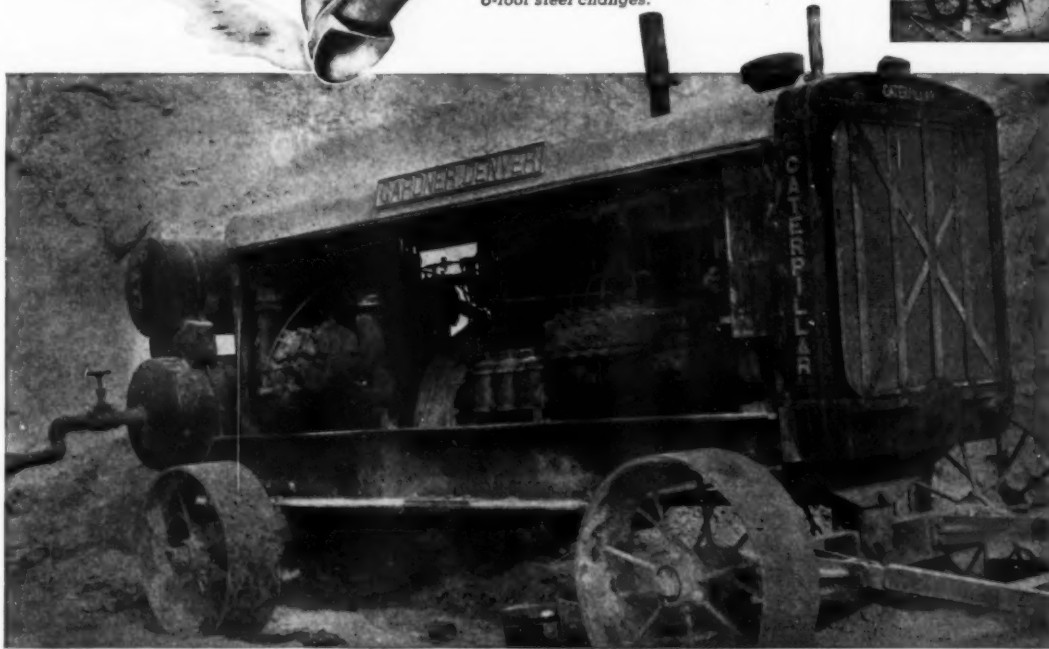
**DO YOUR PORTABLES  
PERFORM LIKE THIS?**



• Every hour this Gardner-Denver 315' Diesel Portable Air Compressor supplies power for four drills at an hourly fuel cost of only 36c, hourly fuel consumption being 4.5 U.S. gallons.

What's more, this Gardner-Denver compressor keeps the job marching on steadily—consistently—day after day—without interruption. That's because Gardner-Denver compressors are WATER-COOLED for constant load—in any season—at any altitude. For consistently high efficiency—and consistently low fuel cost—investigate Gardner-Denver Diesel Portable Compressors. Full information and illustrated bulletins are yours for the asking! Write for our Bulletin PC-11, Gardner-Denver Co., Quincy, Ill.

Here's another Gardner-Denver time and money saver—the UMB Wagon Drill. It's light—mobile—gives you the advantage of 6-foot steel changes.



## GARDNER-DENVER

ANNIVERSARY  
**80<sup>th</sup>**  
YEAR

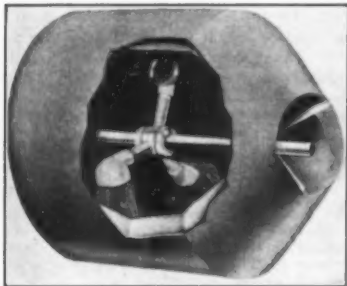
**WON'T QUIT  
or cause time out**



A Hayward Bucket keeps the job going ahead on scheduled time. It won't quit or cause time out.

The Hayward Company  
32-36 Dey Street  
New York, N.Y.

## Hayward Buckets



A New-Style Water Impeller for Blaw-Knox Trukmixers

### New Water Impeller For Truck Mixers

A new style water impeller for use in its line of Trukmixers has been announced by the Blaw-Knox Co., Pittsburgh, Pa. This improved impeller is attached to the water line at approximately the center of the drum. There are three outlets, each of which terminates in a nozzle that is protected against the action of the aggregates, and sealed against intrusion of mortar and cement.

Fast water is important on short hauls or where mixing is not permitted until the truck mixer arrives at the job. To meet these conditions, the impeller was designed to provide fast flow and rapid distribution of water uniformly throughout the batch. The radial distance between the axis of the water pipe and the nozzle discharge opening increases the pressure head. The discharge openings, at right angles to the axes of rotation, create a suction due to the relative motion between nozzles and concrete. Removal of one bolt permits complete dismantling of the nozzle mechanism for inspection and cleaning.

### Waterproof Paper Has New Highway Job Uses

There is no news in a story on the use of Sisalkraft waterproof paper as curing blankets on concrete paving jobs, but it is news that this paper is also being used effectively on oil-mix and cement stabilization jobs. In bituminous stabilization with cut-back, it is necessary to keep the windrows dry. Sisalkraft waterproof paper blankets are being used by numerous contractors to protect the windrows from sudden showers, and over night. In cement stabilization the windrows are similarly protected and in places where the blading can not be completed by dark, the scarified road can be covered with the waterproof blankets and protected satisfactorily over night.

The manufacturer states that this use

of Sisalkraft on stabilized road jobs protects the road builder from equipment and overhead losses due to delay in the work. This Sisalkraft paper is tough, air-tight and waterproof and, it is claimed, may be used over and over again. Complete details may be secured direct from the Sisalkraft Co., 205 N. Wacker Drive, Chicago, Ill.

### Welding Equipment Catalog

Combining the essential information on welding equipment contained in previously issued catalog sections, the new 32-page catalog recently released by the Victor Equipment Co., 844 Folsom St., San Francisco, Calif., describes in detail and illustrates the line of welding and cutting units, torches, regulators and accessories made by this producer of welding apparatus. According to the manufacturer, the catalog has been designed to offer all the essential facts necessary to guide the purchaser in a suitable selection for his particular requirements.

### Power Take-Off Units

#### For All Types of Service

Brown-Lipe power take-offs are designed to meet all operating conditions of continuous or intermittent service, for such equipment as hoists, winches, cranes, spreaders, concrete mixers, generators, distributors, and similar units. They are available in a variety of models, all of which have Brown-Lipe

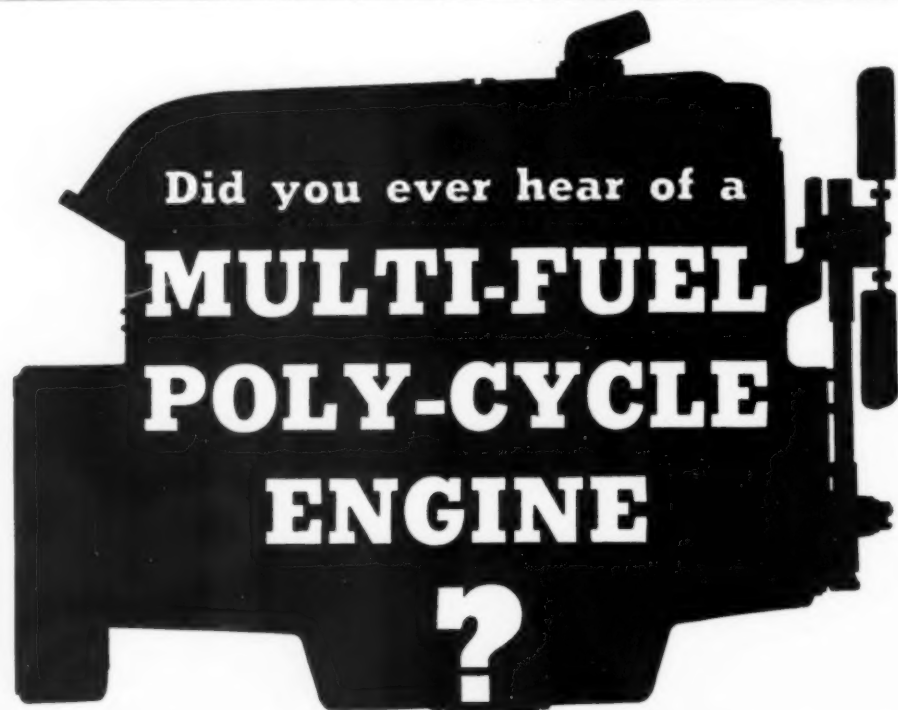
gear boxes, clutches and Spicer universal joints. The gears are made of alloy steel forgings, case hardened after machining, and all shafts run in heavy ball or roller bearings.

A folder describing and illustrating these Brown-Lipe power take-offs and their various applications may be secured direct from the Spicer Mfg. Co., Toledo, Ohio, or from CONTRACTORS AND ENGINEERS MONTHLY.

### "NEVER"

"Never let a concrete road crack." FLEX-PLANE longitudinal and transverse crack control does control cracking when installed properly. FLEX-PLANE ribbon joint material and mechanical joint installers do it.

FLEXIBLE ROAD JOINT MACHINE CO.  
WARREN, OHIO



Do you want to burn . . .

**GASOLINE?  
DIESEL OIL?  
BUTANE?  
NATURAL GAS?**

**WHAT NOW?**

*...from the engineers  
who developed...*

- THE RICARDO HEAD
- THE HY-POWR COMBUSTION CHAMBER
- THE HESSELMAN SPARK DIESEL
- THE INTERNATIONALLY STANDARD FUEL RATING ENGINE

*in the world famous Research Laboratories  
of the Waukesha Motor Co., Waukesha, Wis.*

# OSGOOD



**Power Shovels  
Draglines  
Cranes, Etc.**

Write for New Descriptive Bulletins

$\frac{3}{8}$  to 2 cu. yds.

**THE OSGOOD CO.**  
MARION, OHIO

*A Development of the  
UTMOST IMPORTANCE  
TO ENGINE USERS  
will be presented at the  
World Automotive  
Engineering Congress*

**2:00 P.M.  
MAY 23, 1939**

**Hotel Pennsylvania  
New York City**



## Concreting a Cut-Off On Old Spanish Trail

(Continued from page 2)

emptied the bags on the two batches and a man on the ground picked up and baled the bags for return shipment to the manufacturer.

### Concreting, Finishing and Curing

The Koehring 27-E paver with its 25-foot boom easily handled the placing of the concrete across the 20-foot width of the slab and could shift its scene of operations readily to permit easy placing of the base concrete for strike-off and then return to placing the top course over the reinforcing mat without any shifting of the paver itself. There was very little loss of concrete over the sides of the forms and a very good spreading action with the bucket to minimize the shoveling of the puddlers. With a 60-second mix and a very dry concrete, there still was considerable water worked to the surface under the finishing operations, so that they proceeded rapidly.

After the placing of the base concrete the power strike-off pulled by the winch of the paver cut the surface evenly 2 inches below the top of the forms for the placing of the welded fabric reinforcement. This was followed by the Blaw-Knox gas-electric double-screed finisher, ahead of which four men shoveled the concrete roll to prevent moving too heavy a load and to reduce the accumulation at the sides. Two men on the sides handed in the reinforcing mats to two of the cutters and also spaded against the forms to prevent honeycomb.

Just ahead of the finishers and behind the double-screed machine two men cut the transverse dummy joints at 30-foot intervals between the 90-foot spaced expansion joints, using a T-bar with handles at the ends, pounding the device into the fresh concrete until the slot had been cut to a depth of 2 inches. Into this a 2 x 1/4-inch oiled steel bar was inserted as a guide for the finishers.

The two finishers used a 12-foot Carr longitudinal float consisting of a light steel channel with convenient handles for the operators. Two more men then manipulated the 10-foot Heltzel drag straight-edges to remove laitance and dragged a catenary of 1-inch garden hose over the surface. This operation was followed a short time after, when the surface had dried slightly, with a transverse finishing with a 10-inch wide bow belt. Finally the surface was given a herringbone finish with a drag of burlap pulled back and forth across the concrete in short strokes.

One man finished all the joints and one side against the forms while his helper finished the other side. Two men with a bridge placed damp burlap on the surface immediately behind the finishers and then the next morning the curing crew, consisting of a foreman and about ten men, removed the burlap and placed wet cotton mats on the surface, leaving them and wetting for 72 hours.

In spite of the fact that this was an assembled concreting crew of mostly green hands secured from WPA rolls and working only 8 hours a day, the contractor was able to average 800 feet a day as compared to the same contractor's work of 1,050 feet in the same length of time with a regular organization.

Water for the paver and for the sprinkling operations, which included the subgrade ahead of placing the concrete and the curing, was supplied by a C. H. & E. triplex pump on the bank of a fresh water stream delivering to a 2 1/2-inch line laid along the shoulder.

### Steel and Expansion Joints

A 4-wheel bridge running on the forms

just ahead of the concreting carried all the steel necessary for the center joint and the expansion and contraction joints. It also carried the spray gun for applying oil to the forms ahead of the concrete. Four men handled all the steel setting, including the Laclede center steel with the cross dowels and the steel for the two joints. The center steel was set accurately by centering with a steel angle iron gage from the forms.

Expansion joint steel consisted of 16 round dowels 3/4-inch in diameter and 24 inches long, spaced 15 inches on centers. Alternately across the slab the dowels had metal cups on the forward and on the rear ends and flat hooks over the other ends. The metal cups had nails driven in the ends to keep the dowel 1 inch from the ends during assembly. The dowels were given one coat of red lead before being used and then just before pouring they were greased. Eight long heavy wire chairs between alternate dowels supported the dowels at the mid-depth of the slab. The entire assembly of the steel was tied across and

diagonally to make two easily handled 10-foot cages for placing on the road. Just ahead of actual pouring, the tie wires were cut. The steel for the expansion and the contraction joints was the same.

When pouring an expansion joint a steel slotted header was oiled and placed over the middle of the steel cage and securely held in place with three braces and stakes for each of the two 10-foot lengths of the headers. These were 1 inch thick and were removed after the joint finisher had completed edging the joints. When the concrete was placed around the plate or header it was carefully spaded to insure a smooth even face against the steel. The expansion joints were poured later to within 1/2 inch of the top with the proper amount of hot AC-13 asphalt.

The steel for the center joint which was staked every 2 1/2 feet consisted of 1/2-inch round deformed bars 4 feet long and spaced 5 feet apart with wire chairs to keep them horizontal during pouring.

### Personnel

The Harrison Engineering & Construction Co. of Kansas City, Mo., was awarded this contract on its bid of \$263,681.47. For the contractor, F. R. McKeown was Superintendent and C. E. Murphy was Project Engineer for the Mississippi State Highway Department.

*There is only one way to do a job—the safe way!*

## COMPLETE WELL POINT SYSTEMS

**WILL DRY UP ANY  
EXCAVATION**

*Faster—More Economically*

Write for Job Estimate and Literature

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36-40 11th St., Long Island City, N.Y.  
Tel. IRonsides 6-8600

# MADSEN ROAD PUG MIX-N-TRAVEL

### Features

Positive, volume-control oil pump.

Caterpillar Diesel and Ford V-8 engines.

Caterpillar track assemblies.

Man-ten steel-plate lined mixers.

Replaceable molybdenum white-iron paddle tips on steel shanks.

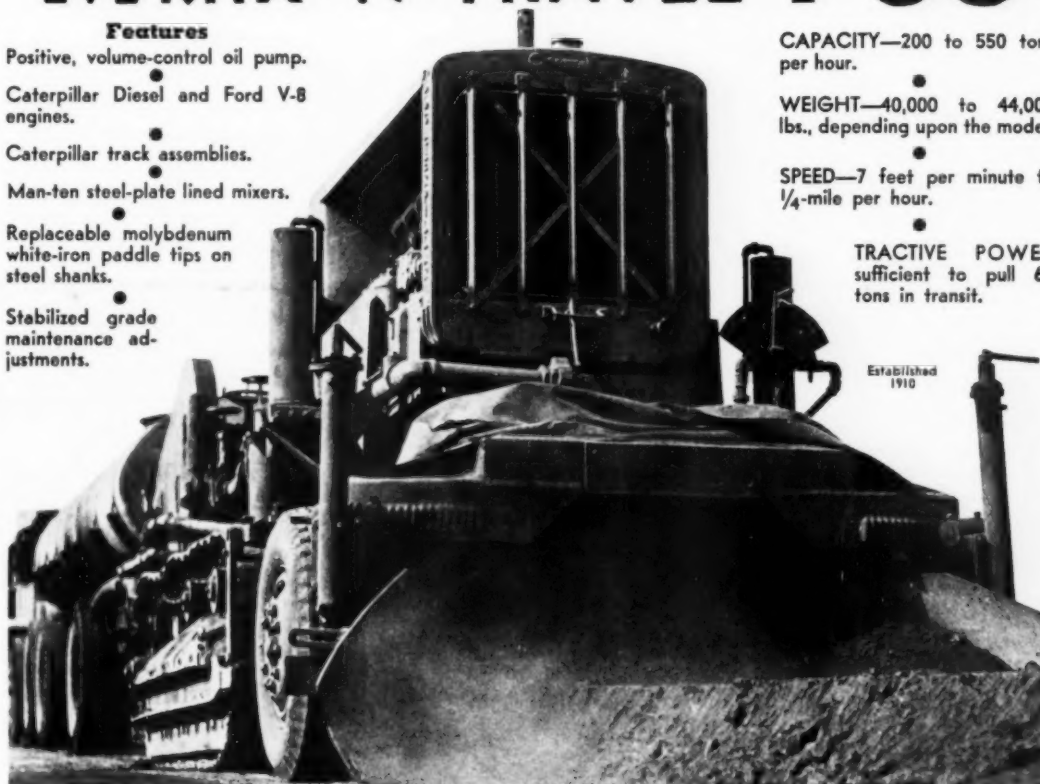
Stabilized grade maintenance adjustments.

CAPACITY—200 to 550 tons per hour.

WEIGHT—40,000 to 44,000 lbs., depending upon the model.

SPEED—7 feet per minute to 1/4-mile per hour.

TRACTIVE POWER sufficient to pull 60 tons in transit.



## MORE ROAD BUILDING MILES (per day)

... and here's WHY—One single unit of equipment, operated by two men, performs all the necessary functions to produce 200 to 550 tons of road mix per hour.

ON THE MOVE the Madsen Mix-N-Travel Road Pug picks up the windrow ... dry-mixes the aggregate ... shoots a primary spray of road oil as it mixes ... adds a secondary spray of oil as it passes further into the double-shaft mixer ... and discharges a road mix that is uniform and in the proper proportion.

THERE IS LESS machinery to worry about with the Madsen Pug—there are no elevators to maintain and no leaders. All controls are close at hand. It is simple in design and positive in action.

The logical construction of the Madsen Road Pug assures a low maintenance cost. The double-action mixer, the double spray injection system, and two separate engines—each with its separate job, all insure a thorough mix at every speed in any quantity up to 550 tons per hour. Oil tank trailers assure safe mix-in-travel storage and save time.

Be Thrifty—See the Madsen Mix-N-Travel Road Pug and save on your next road building job.

# MADSEN

## IRON WORKS

HUNTINGTON PARK, CALIF.

## Wide Variety of Work In Fulton County, Ga.

(Continued from page 2)

and \$300 for the household furniture will reduce the county's actual income about \$500,000. As the expense of the courts, tax receiver and collector, school and other departments can not be reduced very much without impairing their efficiency, the Public Works Department had to stand the largest reduction.

There is no bonded indebtedness against Fulton County, with the exception of some \$200,000 inherited from one of the counties merged with Fulton and this amount is being substantially reduced each year.

The administration of county affairs is in the hands of a board of five commissioners who are elected from the county at large, resulting in county-wide administration of road affairs and ownership of all equipment by the county rather than by commissioners' districts.

### Fulton County Roads

Fulton County is about 75 miles long and 25 miles wide at the widest part and covers an area of 548.25 square miles. Within this area the county has a total road mileage of 2,377 miles, including 834 miles of unimproved earth roads, 487 miles of improved earth roads fully graded and drained, 390 miles of sand clay and top-soil roads, 184 miles of waterbound-macadam (including surface-treated) roads, 279 miles of bituminous-macadam and bituminous-concrete, and 203 miles of plain and reinforced-concrete highways.

In 1932 two adjoining counties were merged with Fulton County, increasing the area from 187 to 548.25 square miles. The added territory was in dire need of public improvements, with only about 15 miles of paved road in the entire addition.

The primary roads of the county are from 20 to 40 feet wide on a 50 to 60-foot right-of-way, using local granite curbing. The secondary roads are 20 to 30 feet wide on a 40 to 50-foot right-of-way, and no curbing is used on these roads.

Fulton County has recently created a Planning Commission, and the road widths will be considerably wider in the future.

### Prison Labor Used

Practically all of the construction and maintenance carried on by the county is by prison labor, non-prison labor being used only for foremen and for operators of the county's equipment. The work is carried on from seven prison barracks, so located that the whole area of the county is covered with a maximum 10-mile radius from any barracks.

Each barracks is headed by a Deputy Warden who has charge of the entire personnel at that barracks, and who is directly responsible to Mr. Clarke. The prison population of Fulton County averages about 1,000 to 1,300 men, which with about 400 non-prison workers constitutes quite a construction force.

The barracks where the prisoners are housed are of frame construction, well-ventilated, and are built in a U shape. The kitchen and mess hall are located across the rear of the building, and the sleeping quarters are in each wing of the U, which are 208 feet long and 24 feet wide, with 48 feet between the wings. All of the barracks are alike, except for the length of the wings which reduces or increases the number of men accommodated. The largest of the barracks houses about 250 men.

### The County's Equipment

For the construction and maintenance activities of Fulton County, a wide variety of construction equipment is owned,

its value running well over a million dollars. This equipment includes two Koehring pavers, six 2-bag mixers, two bituminous distributors, seven 15-ton rollers, two 7-ton rollers, twenty-five crawler tractors ranging from 30 to 60 hp., about half being powered by gasoline and the other half diesel, twenty-two Adams, Galion, Austin-Western and Caterpillar 10 and 12-foot blade graders, four No. 11 Caterpillar Auto Patrols, twenty 4-wheel Ball wagons for short-haul grading, 142 trucks ranging from 1½ to 5 tons in both stake and dump models, two ¾-yard Lorain shovels, two ¾-yard Northwests, one ½-yard Insley, one ¾-yard Osgood, and one Buckeye 160 ditcher.

Six complete crushing and screening plants, with the necessary air compressor and drilling equipment, are owned by Fulton County for quarrying and crushing operations.

Want any information on equipment?  
Write the Editor.

## Walking Dragline Units For Large Dirt-Moving Jobs

An interesting well-illustrated booklet, outlining the history and describing the features of Page walking draglines, is issued by the Page Engineering Co., Clearing Post Office, Chicago, Ill. These Series 600 draglines are built in two standard sizes, Models 615 and 620. A Page diesel engine is the standard power equipment, although if desired Page walking draglines may be equipped with electric power units or diesel-electric power units.

One of the features of these draglines is the simple positive crank action walking mechanism, by means of which the machine can move in any direction. When the operator wishes to move the dragline, he swings the machine in the desired direction, engages the walking gear, and the machine then walks automatically for any distance. Steps are made at the rate of three a minute, approximately 6 feet per step. Steering is simple as the machine always moves in

the direction in which the rear end points.

A description of this and other features of the Page Series 600 walking draglines, as well as a number of interesting photographs showing these units on a variety of dirt-moving jobs, is contained in a booklet which may be secured direct from the manufacturer by mentioning this item, or from this magazine.

## Barrows, Carts and Buckets

The line of contractors' equipment made by Garlinghouse Bros., 2416 E. 16th St., Los Angeles, Calif., is described in a new bulletin recently issued by this company. The equipment includes Gar-Bro contractors' wheel barrows, two-wheel barrows, concrete and material carts, concrete hoppers, and concrete buckets, all of which are illustrated. Copies of this bulletin, No. 53, may be secured direct from the manufacturer on request, or from this magazine.

# CUTTING

... with  
**B-G FINISHERS**

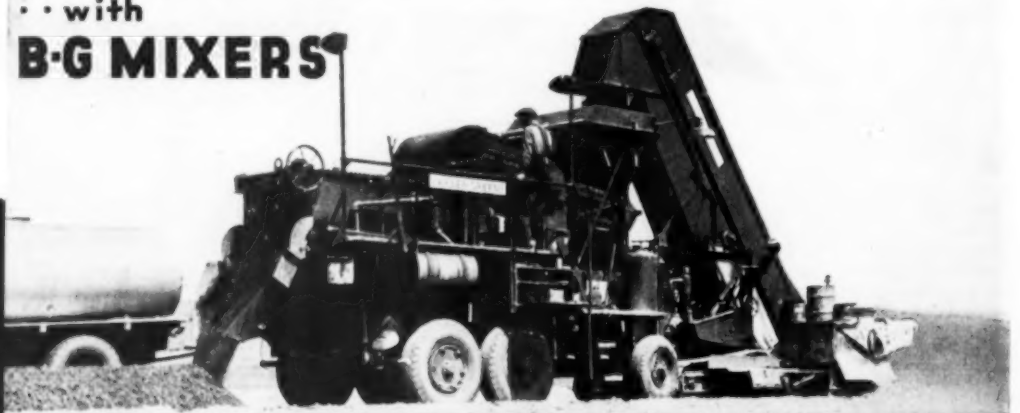


**T**HE B-G Finisher cuts costs while raising mat quality. It requires less labor. Its automatic leveling and simultaneous tamping greatly reduce if not entirely eliminate the patching crew. It reduces rolling. Its 5 ton receiving hopper allows trucks to leave immediately—cutting truck time and costs. Full crawler traction eliminates delays in pushing large trucks, in working upgrade, in traveling over soft ground. Tamping simplifies the matching of adjacent strips. Investigate.

Complete, thoroughly illustrated literature is available on both the Barber-Greene Mixer and Finisher. Phone, write or wire for your copy. There is no obligation. Barber-Greene Company, 485 West Park Ave., Aurora, Ill.

**T**HE B-G Mixer cuts costs primarily through its continuous operation. It handles a relatively small amount of material at any given moment—which permits a machine of comparatively small size and weight for its high hourly capacity. Its high portability, its ability to work in central or travel plant set-ups, and its superiority in both bituminous and stabilized mixing give a valuable cost saving versatility.

... with  
**B-G MIXERS**



# BARBER-GREENE



## Utah's Highway Depots Meet Varied Conditions

(Continued from page 12)

trees are cut in the adjacent forest reserves and "planted" in lines along the roadways to serve as guides for autoists driving through a blizzard. In spite of bad weather conditions, and because of mutual assistance between travelers and maintenance men, there are very few accidents.

When the road does become blocked, due to snow drifts or slides, travel is cut off by control gates located at the eastern and western terminals of the blockaded sections. These controls consist of heavy timber posts set on both sides of the highway and connected by locked cables.

### Strawberry Valley Depots

The equipment at both depots is interchangeable. When trouble develops at the western end of the section, tractors and snow plows are rushed there

from the eastern end and vice versa. The force in the Strawberry Valley depot consists of one foreman, two tractor operators, two truck drivers, five laborers and one cook. The equipment at this depot includes one Galion power grader, one Allis-Chalmers tractor, one Woodbridge snow plow, two Baker snow plows, one Rome grader, one Marmon-Herrington truck, one Ford truck and one International truck.

At the Soldier Creek Depot, there are one foreman, two tractor operators, two truck drivers, four laborers and one cook. Equipment includes one LaPlant-Choate snow plow, one Caterpillar Sixty, one Western snow plow, one Caterpillar grader, and one Marmon-Herrington truck.

### New Bulletin on Methods

LeTourneau Methods, a new bi-monthly publication describing and illustrating methods of handling various earthmoving and construction jobs in order to increase efficiency and lower costs,

has just been announced by R. G. LeTourneau, Inc., Peoria, Ill. Various jobs and the equipment and methods used to handle them are described briefly and illustrated in the March-April issue, copies of which may now be obtained free of charge direct from R. G. LeTourneau or from this magazine.

### Levelless Control for Hoist and Power Take-Off

The Button-Ease control for Hercules hydraulic hoists and dump bodies, which eliminates body levers in the truck cab, is described in Form No. 33 which the Hercules Steel Products Co., Galion, Ohio, will be glad to send to readers of this magazine upon request. One control on the dash operates the power take-off and another, on the floor, operates the Hercules hydraulic hoist.

Other features of Hercules hydraulic hoist and dump body units are the special Tire-Tool Pack dump body, the super-power center-lift hydraulic hoist, and the Eze-Reach tail-gate lever.

## Economical Method Of Widening Roads

(Continued from page 19)

hauling the mix to the road was equipped with a triangular-shaped frame which was placed in one of the back corners of the truck by the oilers before the truck was loaded. This frame aided the material to flow to one corner when the truck was being dumped into the spreader box on the road.

The first operation in preparing the shoulders for widening was to cut a trench 2½ inches deep and 3 feet wide along the side of the pavement. This was done by replacing one section of the blade of the Galion motor grader with a section of blade from which a portion had been cut so that when the blade was allowed just to skim the pavement the outer section cut the trench accurately. Where there was guard rail set at the side of the road it was usually closer than 3 feet from the edge of the pavement so that those sections were skipped by the grader on its first trip and later it returned with a narrower blade for cutting the remainder of the trench. The trench was not rolled ahead of the placing of the bituminous mix.

A 9-foot Burch spreader box with a piece of sheet metal inserted so that the box would spread only at the outer 36 inches was used behind the trucks as they arrived from the pit. One man walked backward just ahead of the truck to guide the driver, two men mounted the truck to help push the material down the body to the spreader box as the material did not slide readily in spite of the oiling of the bodies and raising them with mechanical or hydraulic hoists. Three men with a two-handled stone fork and a single fork worked at the spreader box, moving the material toward the outer side which overhung the trench being filled with the mix. The foreman watched constantly to see that the material was spread about 2 inches above the pavement to give the correct amount of material to fill the trench when compacted. One shovel and one broom man worked behind the placing, cleaning the pavement before any traffic could cause it to adhere to the pavement or stain it with the tar. Attached to the spreader box was a pail of fuel oil into which the tools were dipped frequently to prevent the tar sticking to them.

The loose material was compacted by the outer roll of a 3-wheel Buffalo-Springfield 5-ton roller, allowing part of the roll to ride the pavement so that the mix would be flush with the pavement. This work was done particularly well, for riding over the work during and after completion it was possible to drive onto the shoulder and back without any feeling of the front wheels being swung by the joint between the road and the shoulder.

The additional labor required consisted of a flagman to slow down traffic where the roller was working and another where the mix was actually being placed. A crew of about ten men hand-trimmed the trench behind the motor grader and then went back and hand-shoveled the windrow of material that had been thrown out from the trench into trucks after the trench had been filled with the mix.

This outfit placed an average of 1.75 miles of mix in the widening trench per 9-hour working day on the road. In the same season the best day's work was 2.3 miles on a straight road with little guard rail. The best day of the previous year was 0.5 mile without a spreader box.

Hubert E. Sargent is Commissioner of Highways and Chief Engineer of the State Department of Highways of Vermont.

# COSTS

...with  
**B-G CONVEYORS**



**BARBER-GREENE** Belt Conveyors cut costs first because belt conveyors are by far the cheapest means of transporting bulk materials over relatively short distances. In addition, Barber-Greene's have many other cost cutting advantages. Their Standardized Sectional Construction gives easier faster erection, more flexibility, prompt shipment from stock, and a high resale value. Barber-Greene Belt Conveyors are built for contracting.

**T**HERE isn't any way of loading material from stock piles to trucks cheaper than with Barber-Greene Bucket Loaders. They use less power than an intermittent method, and require less operating skill. They save truck time, man time, and job time. They are used for loading, stripping, light excavating and screening. Their versatility makes them useful the year 'round.

39-21

You should have a copy of the Barber-Greene Belt Conveyor Catalog. It covers all sizes, Portable and Permanent. Bucket Loader Literature also available. Ask for your copy. There is no obligation. Barber-Greene Company, 485 West Park Ave., Aurora, Ill.

...with  
**B-G LOADERS**



# - GREENE





C. & E. M. Photo  
A Northwest Pull Shovel and Dumptor  
Worked in Tight Quarters to Dig the  
Cut-Off Trench at Prado Dam

## New Earth-Fill Dam For Flood Control

(Continued from page 2)

vation. The dam is 2,250 feet long at the crest.

A concrete ogee spillway is located to the north of the dam and is 1,000 feet long. It is designed for a maximum surcharge of 13 feet on the crest, which will give a discharge of 178,000 cfs. A total of 3,100,000 cubic yards of excavation is required for the spillway and 143,500 cubic yards of concrete for its construction. The outlets provided in the dam consist of six gated outlets 7 x 12 feet and two ungated openings 5.5 feet diameter. With the water at spillway crest elevation the discharge will normally be 9,200 cfs, with a maximum of 17,300 with all gates open. In the construction of the outlet structure 275,000 cubic yards of excavation is required and 37,200 cubic yards of concrete.

The drainage area contributing to the Prado flood-control basin is 1,466 square miles, which does not include the drainage area of Lake Elsinore, which is 798 square miles. This lake normally has no outflow and is rapidly becoming salt. It is not expected that a flood would occur which would cause an outflow from Lake Elsinore, but the Prado Dam control structures are designed so that such a flood could be checked without damage to the control structures.

### Excavation

Spillway excavation at the site is in a poorly consolidated sandstone which requires rooting before loading with the 25-yard Wooldridge scrapers, eight of which, hauled by D8 tractors, are used by the contractors. During loading, D8 tractors are used as pushers. Each of these tractors is equipped with a pusher plate at the front of a triangular frame carrying sloping blades, which act as grading blades to smooth the roadway and also to protect the tires on the scrapers in case the pusher-tractor operator misses the pusher beam on the back of the scraper. In the stripping of the borrow pit for the dam, six of these scrapers operate eight hours and, with an 800-foot haul, handle 20,000 yards daily.

Most of the material for the dam will come from spillway excavation, part of which is now being stockpiled and will be rehandled as a contract item. This sequence of operation, including rehandling, was definitely planned because of the desire to get the concrete work in the spillway section out of the way and, further, a line of the Santa Fe Railroad

runs through the dam site and it is necessary to relocate this line before work on the dam can be pushed with any degree of speed and organization. The impervious borrow is upstream from the spillway and in an area about 1/4-mile square. The maximum haul to the far end of the dam for this impervious borrow will be about 3,000 feet.

The cut-off trench between the dam and the spillway was dug by a Northwest pull-shovel working in very tight quarters, so that the boom and the tail of the shovel were constantly hitting the sides of the excavation. The pull-shovel loaded to a fleet of Koehring Dumpsters. On the job the shovel and hauling unit is known as "the Corrigan gang" as all of them pull backwards.

All of the excavated material being placed in final position is thoroughly compacted with the proper moisture content furnished by a fleet of streamlined tank trucks and rolled with eight unit gangs of Southwest sheepfoot rollers.

As the job is being worked three 8-

hour shifts, night illumination is an important factor. One 40-foot and one 50-foot wooden tower have been built with four floodlights on top and each equipped with a LeRoi engine driving a Marble-Card 5-kw generator. These towers with the housing for the generating units are mounted on skids for easy moving from one part of the borrow pit or embankment to another.

### Personnel

The contracts for the construction of Prado Dam and control structures were awarded to W. E. Callahan Construction Co., Guthrie-Marsch-Peterson Co., Geo. W. Condon Co. and J. P. Shirley, as co-adventurers, on September 23, 1938 for their low bid of \$3,639,795.00 with an allowance of 925 calendar days for completion. Each of the units comprising the Prado Constructors is handling its own part of the work, with E. E. Ashlock, General Superintendent coordinating the project, and Everett Seabury in charge of dirt moving. The work is being done under the direction of Major

Theodore Wyman, Jr., District Engineer, U. S. Engineer Department, with Captain George K. Withers as Operations Officer, Captain N. A. Matthias as Chief of Engineering, and Kenneth J. Harrison, Resident Engineer.

### Barber-Greene Announces

#### Sales Department Changes

Barber-Greene Co., Aurora, Ill., has announced several changes in the organization of its Sales Department. B. E. Lindstrom, formerly manager of the Chicago office, has been made District Manager in charge of the central states. E. H. Cooper is now District Manager of the southwestern states and E. L. Benson, who has been in charge of bituminous paving promotion, is now District Manager of the northwestern states. W. B. Holder continues as Eastern Manager.

If you have any special lubrication problems, write the Editor. He will be glad to help you.

# Shall it be...

Lighter Loads?  
Longer Hauls?  
Wider Turns?  
More Expense?

or

## THE CLETRAC TWO-TRACK POWER TURN?

When a job shows bad ground, tough grades or awkward layout, Cletrac's TWO-TRACK POWER TURN with its ability to pull on shorter turns and on greater grades enables you to make your contract pay out "as figgered."

With Controlled Differential Steering Cletracs pull on both tracks when turning.



Maneuvering in close quarters is easy with Cletrac's two-track power turn.



Even under the most unfavorable conditions, Cletrac's power and traction handle big loads.



● Without Cletrac's two-track power turn you can either haul lighter loads, take a wider arc turn to hold your power and traction or make a long haul-around—at extra expense and added job time. The profit-making answer in any case is Cletrac with both tracks pulling on the turn as well as on the straightaway.

With Cletrac you always have double track power when you need it most and a soil gripping crawler track that puts the power pull into the pay-load. Controlled Differential Steering is the engineering term for this feature. What it means to the contractor is great all around power, nimble maneuverability and a decidedly lower cost for every haul.

Not exactly a Water Bug, but Cletracs are light weight. They have no excess weight as ballast to secure effective traction. This assures larger load handling capacity, less fuel consumption.

It's an unbeatable combination—Controlled Differential Steering in a correctly balanced tractor equipped with a sure grip crawler track! Ask your Cletrac distributor to demonstrate these features on your job.

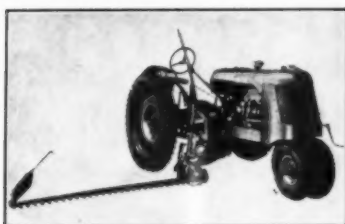
14-95 HORSEPOWER

**Cletrac**  
Crawler Tractors  
Built to Last

GASOLINE OR DIESEL

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The New Huber Mowing Attachment on a Huber Model B Tractor

### Mower Attachment For Light Tractor

A new mowing attachment for use on the new Model B light-weight tractor, converting the tractor into a power mower, has been announced by the Huber Mfg. Co., Marion, Ohio. The mowing attachment is a self-contained unit which can be attached to the tractor or removed in a few minutes and is driven by oversize V belts direct from the power take-off of the tractor.

A feature of the mower is a sickle which runs at full stroke, no matter at what angle the cutter bar is raised or lowered, according to the manufacturer. The sickle will cut approximately 45 degrees below horizontal, and the cutter bar may be raised or lowered with either a hand lift lever or a foot pedal from approximately 45 degrees below horizontal to 45 degrees above. The cutter bar is equipped with a spring release which operates instantaneously when a stump or other obstacle is encountered, automatically shutting off power from the sickle bar and thus preventing undue damage to the knives. The cutter bar, available in three standard lengths of 5, 6 and 7 feet, is located in front of the right rear wheel where the tractor operator can see it at all times. The mower itself can be thrown out of gear from the operator's seat by means of a conveniently located hand lever.

The Model B tractor, for use with which the new Huber mower is designed, is a light-weight unit designed to operate in close quarters where there are trees or other obstructions. The top of the Model B is only 48 inches from the ground, permitting its operation under tree limbs. It has a sturdy 4-cylinder heavy-duty motor with sufficient power to pull two 14-inch plows.

Complete information on these two new units may be secured by interested contractors and state and county highway departments direct from the manufacturer or from this magazine.

### Jacks Used to Raise Pennsylvania Highway

Sunken slabs of concrete paving on several stretches of state highway in Pennsylvania were raised recently by an unusual method, under the direction of F. A. Sesler, of the Pennsylvania State Highway Department. Several methods of raising the slab were considered. As the slabs were cracked in several places, it was necessary to secure a uniform lift on the entire slab area. Because of the nature of the terrain along the highway, floating or hydraulicking was not feasible. After due consideration of the problem, the method of jacking was selected.

Trenches about two-thirds of the highway width were dug at intervals under the slabs to be raised from both sides of the road, and cribbing installed. The timbers were as long as each trench, in order to distribute evenly the weight of the slab. Simplex 25-ton steel shoring jacks and Simplex ball-bearing screw jacks were placed against the cribbing and quickly raised the slabs to their original height. It is reported that there was no surface variation whatever where the raised slabs joined the portions of the highways which had not settled.

The jack equipment purchased for

this job stood up very well under the severe service, and jacks, lever bars and much of the timber and cribbing materials were salvaged for future use.

### Convertible Trailer Announced by Jahn

The latest model in the line of Jahn trailers made by the C. R. Jahn Co., 1347 W. 37th Place, Chicago, Ill., is the Model DHD-620. Carried on six wheels, this new heavy-duty trailer has a capacity of 40,000 pounds. It is completely convertible to a semi-trailer, without mechanical changes of any kind, by removing the front dolly assembly. A standard size kingpin which will fit any regular semi-automatic fifth wheel is used.

Other features of this new trailer include deep wide-flange main beams, numerous cross members and gusset plates, spring-mounted front dolly, internal expanding brakes, and the latest development in positive brake equalization.



For tearing through on tough jobs or just plain bulldozing, Baker Bulldozers and Gradebuilders can be depended on to pull you through at a lower operating cost. Write for latest bulletins.

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555 Stanford Ave. Springfield, Illinois



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Bulldozers  
and  
Gradebuilders  
have every feature  
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**BAKER**

Hydraulic Scrapers with flat digging angle, 3 yd., 5 yd. (2 wheel) and 8 yd. (4 wheel). Ask for details on these outstanding new scrapers.

*Another repeat Order for* **CP** **AUTOdrippers** for World's Greatest Tunnel Job

One of the contractors working on Delaware Aqueduct—117 miles of tunnel—purchased a number of CP AUTOdrippers when he started his first contract. They have so definitely proved their superiority in **FASTER DRILLING SPEED—LOWER AIR CONSUMPTION—LOWER MAINTENANCE—EASY HANDLING**—that he has again ordered CP AUTOdrippers. Write for S.P. 1956 which fully describes CP AUTOdrippers.

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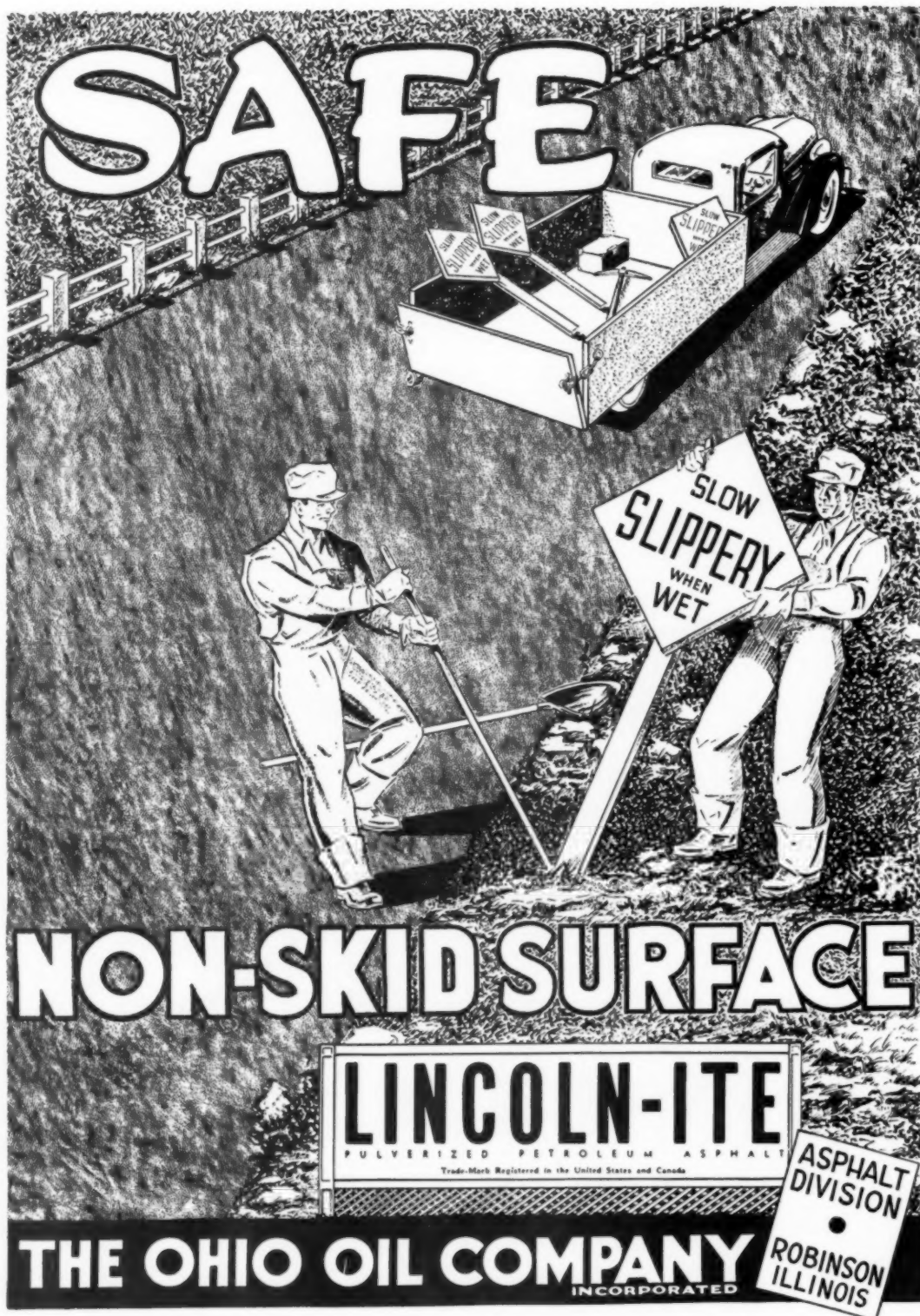
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ASPHALT  
DIVISION  
ROBINSON  
ILLINOIS



# Soil-Cement Stabilization Of Heavy Clay Road Bases

## Combination Top Soil and Cement Stabilization Job Completed Last Year in South Carolina

† THE Boyle Road & Bridge Co. of Sumter, S. C., was awarded a series of projects on its bids for the construction of portland-cement stabilized base or top-soil base with bituminous surfacing between Abbeville and Lowndsville, and Calhoun Falls and Lowndsville, S. C., last spring. In this group of contracts there was also a 456-foot concrete arch bridge to be described in a later article.

State Project 805 included 4.3 miles of the portland-cement stabilization and 2.0 miles of top-soil base with a break of 2.0 miles of top soil already completed under another contract. South Carolina is turning to stabilization of subgrades because there is not enough top soil of suitable character available near enough to the roads which require such treatment. This contract was awarded on alternate bids for portland-cement stabilization and tar stabilization, and the former was low. The project was built with a 21-foot base 4 inches thick primed 20 feet wide for a 20-foot surface treatment. There are 3½-foot shoulders on either side, a 4 to 1 front slope and a 1 to 1 backslope. The finished base has a crown of 2½ inches in 21 feet.

### Preparatory Work

The clay in the subgrades in this section of South Carolina is very heavy, averaging 60 per cent clay and silt, and one section on this project had 93 per cent clay for about 4,000 feet. The graded road was sampled at 500-foot intervals and analyzed at Columbia in the State Laboratory for grading, clay and silt. The amount of cement needed to stabilize the material at each soil change was figured and the optimum moisture content determined by laboratory methods. In the richest clay the optimum moisture content ran about 25 per cent, and down to about 17 per cent minimum. On this contract the amount of cement added to the clay was 0.062 barrel per square yard of 4-inch compacted base. This was increased after the laboratory tests showed that better results could be obtained with 0.079 barrel per square yard.

### Applying the Cement

The subgrade to be stabilized was first scarified to a depth of 4 inches, windrowed to the sides and then to the middle so that the material to which cement was added would have the proper depth. The material was then pulverized completely with a 16-disk harrow and mixed with a blade to a depth of 4 inches and the loose material windrowed to the center of the road. A Barber-Greene road mixer was used for the mixing of the cement and the road material. It was run down the windrow of pulverized subgrade material and the feeder and bucket elevator picked up the windrow and delivered it to the main material hopper at the top of the machine. A separate hopper was built at the side for the cement which was delivered to the pug mill of the Barber-Greene machine about one-third of the distance from the point where the subgrade material entered and the delivery of the mixed material to the road again. The pulverized subgrade material was fed at a uniform rate to the pug mill by the conveyor feeder and controlled by the

feeder gate at the hopper. Water was added to the mix in the pug mill about 2 feet from the discharge end. At first the water was added immediately after the cement but there was too much balling of the clay before the cement had been sufficiently distributed through the mass of the clay. Even with the delay in the addition of the water there was still some balling of the materials as they were discharged to a windrow on the road.

The material in the windrow was worked continuously with a disk harrow and road machine until all soil, cement and water were distributed uniformly.

After the blading and mixing was completed, the mixed material was spread for the full 21 feet and rolled with Euclid and Blaw-Knox sheepsfoot rollers until the material was compacted right up to the surface. During this time it was continuously bladed with a new Adams hydraulic-control tandem-drive patrol grader. The work was so thorough in compaction that the marks of the sheepsfoot roller could be seen in the finished base surface. The base was rolled and held to the optimum moisture content to give a density of material so that the final base weighed between 105 and 108 pounds per cubic foot. The final rolling was done with a 9-wheel Bros rubber-tired roller pulled by a Farmall tractor. This was continued until all of the top layer was bound in and no loose material was apparent on the surface.

Throughout this work it was necessary to take care of local vehicles but no heavy through traffic was permitted. A suitable detour was furnished around the work.

### Single Bituminous Treatment

The completed cement-stabilized base was swept with a rotary broom and the dust removed with a blower. It cleaned very easily, requiring only one trip with the broom and blower equipment. The top was then primed with an 8 to 13-viscosity tar at the rate of 0.2 to 0.25 gallon per square yard with a 1,500-gallon Rosco distributor. Where it was

(Concluded on page 46)

## TARPAULINS ROAD MATS WINDBREAKS

CONTRACTORS' SUPPLY DEALERS in every state sell the Fulton line. Specify SAURE-DAY and FULTON Tents, Tarpaulins, and Windbreaks—anything made of canvas. Also Fulton Road Mats and Burlap. Fulton products are good and their prices are right.

If your dealer can't supply you write our nearest plant for catalog, samples and price list.

### Fulton Bag & Cotton Mills

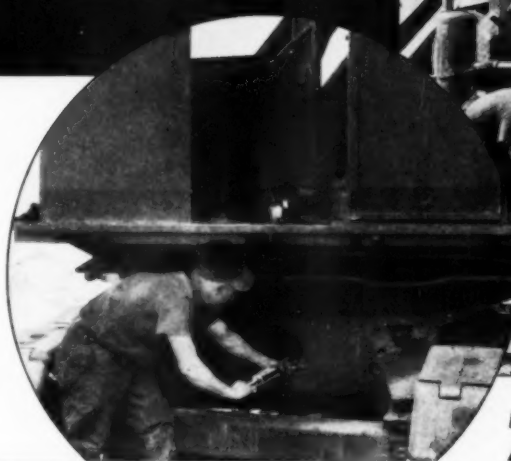
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# BIG PROJECTS Completed on Schedule

## DEMAND DEPENDABLE LUBRICATION!

### Alemite Guns Help Prevent Costly Delays



### HARTFORD CONTRACTOR USES ALEMITE EQUIPMENT TO SPEED RECONSTRUCTION IN WAKE OF HURRICANE

WRECKAGE and destruction marked the wake of the hurricane which tore through New England last year. Savin Construction Company of Hartford, Connecticut, was one of the firms engaged in replacing highways and bridges. Time was all-important! Delays caused by machine breakdowns resulting from bearing failures would have been *terribly expensive!* J. R. Condon, train operator for Savin, took a minute off to show how easily such failures were prevented by regular lubrication of the Multi-Foot Power with the Model 5256 Alemite

Hydraulic Gun. At left is a Lorain Diesel Crane being lubricated with an Alemite Dot gun. Alemite No. 33 Lubricant is used on both machines.

Mr. Condon says, "You can write your own testimonial as far as we're concerned!"... and that's typical of the way contractors feel about Alemite Equipment and Alemite Lubricants. Whether it's a single hand gun or a complete Alemite Portable Service Station, it's built to stand that endless punishment which is characteristic of construction business. Write for catalog!



This new type FREE FLOW Alemite Giant Button Head Fitting makes thorough lubrication easy. Little effort is required and systematic lubrication is encouraged. Opens readily under slight pressure; when pressure is released, valve snaps back to closed position preventing escape of lubricant, sealing bearings, assuring longer life for machines.

# ALEMITE

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WORLD'S LARGEST MANUFACTURER  
OF LUBRICATION PRODUCTS

## Drilling Varied Rock For New York Subway

(Continued from page 11)

maximum stroke of 44 inches, of which 32 inches was used for each shove. In addition, there were three 8-inch diameter table jacks with a 33-inch stroke.

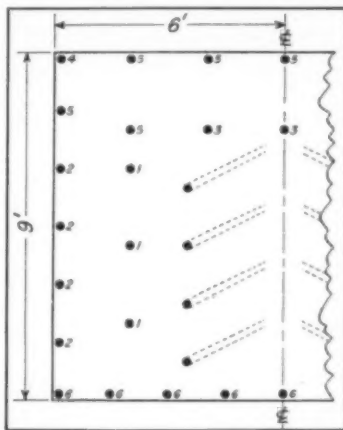
The hood at the top projected 32 inches beyond the lower cutting edge of the shield, while the tail of the shield held two rings plus 4 inches. The controls for the seven left-hand jacks, as well as the seven right-hand jacks, were at mid-elevation on the shield on either side of the center pocket, and immediately below them on the center platform were the controls for the erector arm.

Two-inch tie rods with turnbuckles were attached to the ribs formed by the two flanges of adjacent rings and tightened up to hold the rings in a true circle before packing with pea gravel or grouting. These tie rods were about 5 feet 8 inches above the decking on which the industrial railway tracks for the muck cars were laid. Consequently any man of average height, unless he stooped, was liable to hit his head on the bars in moving about on the decking. Men of more than average height walked with a distinct stoop, and the hard hats worn by all men in rock operations saved more than one head bruise from contact with the tie bars. Every laborer and engineer on the job was required to wear a M.S.A. hard hat furnished by the contractor. The decking was carried on 8 x 8 ties laid on the invert of the tunnel.

On the brackets to which the tie rods were attached was one 12-inch channel 25 feet long on each side, which carried the platform from which top iron was built and which also carried an Ingersoll-Rand tugger hoist for snaking small boulders out of the heading and raising the sections of the 10-inch low-air line. It also carried the gravel pans for the packing around the rings and the Ransome pneumatic grouting machine when in use. The platform was pulled ahead with each advance shove by cables attached to the frame of the shield.

### Drilling and Blasting

Three different methods of drilling the face were employed. In free air six drifters were used mounted on a jumbo running on the industrial track and fully equipped with a Roto-Clone fan and filters which effectively and continuously maintained a dust count of less than 1,000,000 per cubic foot in the tunnel air. When driving the 9 x 12-foot drift ahead of the shield in good rock, four



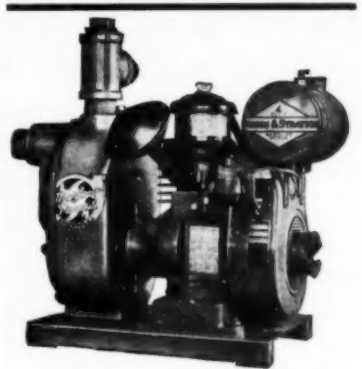
Drilling Diagram of the Drift in Solid Rock on Section 6, Sixth Avenue Subway, New York City, Showing the Instantaneous Cut Shots and Delays

Ingersoll-Rand DA 35's were used, mounted on columns. When drilling

from the shield, two of these drills were used on 4-inch pipe columns carried by the shield itself with offsets which permitted radial drilling. In the bottom of the shield one I-R jackhammer was used. Timken detachable bits, 2½-inch diameter, were used for drilling with various lengths of steel. In the drift an 8-inch cut was made with a 6-foot side round, while for the shield the holes were drilled only to a depth of 3 feet. The high-pressure air line, carried just above the spring line of the tunnel iron, terminated at the platform immediately behind the shield with a manifold capable of handling six high-pressure air hose for the drills.

All sand for tamping the explosive in the holes was dried over an electric heater near the shaft and then poured into paper bags and hauled forward as required. The holes were loaded with 60 per cent du Pont dynamite, using about 90 sticks in the cut shot in the drift, with a total of about 150 pounds per round. Only 50 pounds of dynamite

(Continued on next page)



### New 1½" Pump

3,000 g.p.h., 25' self-priming suction lift guaranteed. Total head up to 55'. In aluminum or cast iron. We also make self-priming centrifugal pumps up to 10" size.

Write for Bulletin No. 11

Manufactured by

**MARLOW PUMPS**  
Ridgewood New Jersey

## CHEVROLET TRUCKS FIT THE MOST JOBS



### National Truck Sales are up 19.1% Chevrolet Truck Sales are up 29.7%

Chevrolet's volume increase in 1939 registrations to date (as compared with the same period in 1938) is greater than the total volume increase shown by all other makes combined.

Chevrolet is up 29.7% in 1939 truck sales over 1938—the rest of the industry, excluding Chevrolet, is up 13.8%.

What is causing the national swing to Chevrolet? It must be something more than Chevrolet's lower prices alone—for truck buyers are the kind that would willingly pay higher prices if they could get more value per dollar.

Percentages based on latest available R. L. Polk & Company registration figures.

The true answer is Chevrolet's lower prices plus Chevrolet's proved record of economy and efficiency plus Chevrolet's expanded line (45 models, nine different wheelbases) for 1939.

Now there's a Chevrolet truck fitted to your hauling needs. Whatever your job calls for—trucks ranging from light delivery units to massive heavy-duty trucks of 14,000 pounds gross rating—there is a Chevrolet suited to your work.

CHEVROLET MOTOR DIVISION, General Motors Sales Corporation, DETROIT, MICHIGAN  
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MASSIVE NEW SUPREMLINE TRUCK STYLING... COUPE-TYPE CAB... VASTLY IMPROVED VISIBILITY • FAMOUS VALVE-IN-HEAD TRUCK ENGINE • POWERFUL HYDRAULIC TRUCK BRAKES (Vacuum-Power Brake Equipment optional on Heavy Duty models at additional cost) • FULL-FLOATING REAR AXLE on Heavy Duty models only (2-Speed Axle optional on Heavy Duty models at additional cost)



### New PRESSURE MARKER for All Types of Striping Jobs

Low cost, hand-propelled, all-purpose traffic line marker provides uniform coverage, perfect penetration, clean-cut edges. Ideal for all cities—large or small. Easily converted to handy paint spraying unit. Gives year-round service. Speeds up marking jobs. Reduces costs. Also, power driven unit capable of marking 12,000 to 15,000 feet per hour. Write for literature.

MEILI-BLUMBERG CORP.

Box C-5 New Holstein, Wisconsin



MEILI-BLUMBERG



## Building Iron Rings For Sixth Ave. Subway

(Continued from preceding page)

was used per round in the shield when the bottom drift had been taken out.

The accompanying drilling diagram shows the approximate spacing and delays for the average 45 holes used in driving the drift. The holes for the remainder of the face when the shield was advanced numbered about 40, driven 2 feet apart over the face, and a ring of rib or breaking-down holes 18 inches apart at the circumference and all drilled 3 feet deep.

Immediately following the firing of a round, the valve on the ventilating line was opened and the 3-foot square screened funnel at the end of the ventilation or smoke pipe pulled in most of the smoke from near the face. In addition, two small pipes of 3 and 4-inch diameter located close to the top of the iron drew out the hot gases and smoke which rose to the top at some 50 to 70 feet from the face. The smoke line vented to the atmosphere outside the bulkhead, the pressure of air in the tunnel forcing the smoke out when the valves were opened. Immediately after a shot was fired a 2-inch connection in the high-air line carried forward into the heading was cracked to agitate and blow back the smoke and gases so that they would more readily be blown out through the smoke line. Also, as soon as the face was clear of smoke, it was sprayed with water to lay all dust.

### Mucking

The drift, and even the tunnel itself in this instance, was too small for effective machine mucking. The size of the bottom pocket in the shield would permit only one man working in it to move the muck through to the men loading on the outside, so the use of a conveyor was planned to speed the moving of the material from the face through the pocket. A cleated conveyor was used to good advantage for this purpose, even though the pocket in the shield through which the conveyor delivered the muck would not permit the conveyor to deliver high enough to the buckets on the cars. Even a longer conveyor would not have helped because of the low headroom caused by the tie rods. With the shield operating, four muckers shoveled to the belt conveyor which carried the rock through the shield, dumped it on a metal platform and three men loaded it by hand direct into the 2-yard Koppel bucket carried on the Koppel industrial railway flatcars. Each foot of tunnel contributed 10 yards of muck. The average muck removed per 3-hour shift was from 12 to 14 buckets. An average of 10 to 12 truckloads of rock per day was delivered to the top of the shaft and hauled to the 96th Street dump on the West Side Highway. One Mancha electric locomotive in the air handled two cars at a time, each with one bucket. A single line of track was used for the length of the tunnel, with a spur at the shield and a run-around near the muck-lock. An extra car and bucket was always left at the shield when the locomotive was hauling two or three cars of full buckets to the muck-lock.

### Building Iron

Each cast iron ring measures 17 feet 5 inches outside diameter, 2 feet 8 inches wide, and consists of six A segments, two B segments and one key plate. The A segments have an outside arc dimension of 80.3992 inches, the B segments 80.7741 inches, and the key, 12.6499 inches. The weights for the A segments vary from 1,875 to 1,890 pounds, the B segments from 1,880 to 1,890 pounds, and the keys from 445 to 455 pounds. The A plates are faced on the radius and

the B plates are faced on one end for the radius to match the A plates and on the other end for the key. In addition, there are also A and B segments and keys with  $\frac{3}{4}$ -inch taper to permit a change in grade and line. All longitudinal joints were broken and the position of the keys was varied in each ring.

Contrary to standard construction, in which the segments are usually 2 feet 6 inches wide, these segments were 2 feet 8 inches wide, requiring a center rib to give additional strength to the  $1\frac{1}{4}$ -inch plate. This center rib prevented the use of the standard bar for setting the segments. A special "gadget" bar with a U-shaped section to straddle the center rib had to be built. This was much heavier than the standard connector and more awkward to use, thus considerably slowing progress in building iron. The center rib also made the concreting of the tunnel more difficult and required extra grout holes in the concrete lining of the tunnel to get grout on both sides of the center rib.

In the yard at the top of the shaft the



Harry Pagliaro, General Superintendent, Spencer, White & Prentiss.

segments were unloaded and stacked for storage. Two men with an Aeroil blow torch burned off the paint and wax placed on the machined edges to prevent rusting, before the segments were delivered to the tunnel cars. Then two A segments or two B segments and one key

were loaded on each car for hauling through the muck-lock to the shield. It required four cars to carry in one ring. Each car carried a bag containing the necessary bolts, washers and grommets for the segments on that car. The crew building iron consisted of a foreman and four men. The speed of construction, including drilling, shooting, mucking and building iron, when working on the tunnel face from which the drift had been excavated, was about one ring every six hours.

A total of eighty-five  $1\frac{1}{4}$ -inch bolts were required for every shove of the shield. These were first spun up with a compressed air wrench and then tightened with a standard hand wrench followed by a  $4\frac{1}{2}$ -foot ratchet wrench operated by two men. The specifications required a compression of 25,000 pounds per square inch at the bolt head. Each bolt had the usual grommet of hemp soaked in red lead and boiled linseed oil to act as a packing in the hole. All iron was pulled so close that no iron

(Continued on page 44)

**WE SAID IT 5 YEARS AGO**  
**-Now Hundreds of Users Have PROVED IT!**

Back in 1933, we said, "The most practical way to build excavators from the user's point of view is with rolled alloy steels!" Now, users everywhere—hundreds of them—have proved that these stronger, faster operating machines are more profitable to own. Designs originated by P&H are gradually being adopted by the excavator industry. P&H has all these advanced ideas now in this line of excavators—"5 years ahead of the field." User experience is yours for the asking. Harnischfeger Corporation, 4419 W. National Ave., Milwaukee, Wis.

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 18  
 Different Sizes  
 From  $\frac{1}{2}$  to 5 cubic  
 yards Capacity;  
 Gasoline, Diesel or  
 Electric Power.

**HARNISCHFEGER**  
 CORPORATION

EXCAVATORS • ELECTRIC CRANES • ARC WELDERS  HOISTS • WELDING ELECTRODES • MOTORS

### Steel Highway Products

Two new bulletins, one devoted entirely to steel road forms and the other to its line of highway products including steel fabric, expansion joints, contraction plates and guard rail, have been issued by the Truscon Steel Co., Youngstown, Ohio. Both of these bulletins, No. Q-110 and Q-140, respectively, contain complete descriptions of the various products as well as construction and erection details, and are well illustrated. Copies may be secured without cost by those interested direct from the manu-

facturer by mentioning this item, or from this magazine.

### Engines and Power Units

Allis-Chalmers heavy-duty engines and power units are built in five sizes, rated from 19 to 102 maximum brake horsepower, and may be equipped to burn gasoline, kerosene, distillate, natural gas or butane. Being of the medium-speed heavy-duty type, they are suited for all purposes requiring an economical, dependable source of power, according to the manufacturer.

Detailed information is contained in a new bulletin which may be secured direct from the Allis-Chalmers Mfg. Co., Tractor Division, Milwaukee, Wis., by mentioning Form No. MS-224.

### New Barber-Greene Dealer

The Barber-Greene Co., Aurora, Ill., has appointed the Contractors Sales Corp., Albany, N.Y., as its representative in the central part of New York State to handle Barber-Greene bucket loaders, bituminous mixers and finishers, belt conveyors, and ditchers.

### New Lansing Catalog

Catalog No. 14, describing and illustrating the complete line of contractors' equipment made by the Lansing Co., Lansing, Mich., has recently been issued by that company. Wheelbarrows of all sizes and types, concrete carts, portable concrete mixers, hoists, chutes, dirt-moving scraper buckets, and wheels for all purposes are included.

Copies of this catalog may be secured by interested contractors and engineers direct from the manufacturer or from this magazine.

# STANDARD OIL ASPHALT SERVICE

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*Asphalt for  
every purpose*

**STANDARD OIL COMPANY**  
(INDIANA)



## Avoid Legal Pitfalls

These brief abstracts of court decisions may aid you. Local ordinances or state laws may alter conditions in your community. If in doubt consult your own attorney.

Edited by A. L. H. STREET, Attorney-at-Law.

### Contracting to "Satisfy"

"You contracted to make those repairs and improvements to my satisfaction," an owner reminded a New Jersey contractor. "I'm dissatisfied and therefore decline to pay you the balance of the contract price you claim. Furthermore, I demand damages for your failure to comply with your undertaking." And that is where the lawsuit of Grobarchik v. Nasa Mortgage & Investment Co., 186 Atl. 433, was born.

The trial judge, after hearing all the evidence offered in the case, decided that the owner was really satisfied, despite his claim to the contrary and awarded judgment in favor of the contractor. Upholding the judgment, the Supreme Court said:

"Credible evidence of the full performance of a contract for the doing of work of this character, in strict accordance with its terms, justifies an inference that the owner's rejection of the work was arbitrary, and in bad faith, to escape liability for the contract price. Unreasonable dissatisfaction with the work done does not, however, afford the basis for a conclusive inference of bad faith. The honesty of the judgment, or the genuineness of the expressed dissatisfaction, is a mental state not capable of direct, precise proof, but is a matter of factual inference from all the proved facts and circumstances, particularly the acts and conduct of the one whose state of mind is the subject of inquiry. \* \* \* Whether the particular contract be construed as calling for actual satisfaction, as distinguished from reasonable satisfaction must be characterized by good faith."

Comment: At best, a contractor walks on thin ice when he undertakes to do work to the owner's satisfaction.

### Hazards of Public Contracts

Furnishing labor or materials on a public job, without sizing up legal restrictions on the right to compel payment, is akin to driving a car across a busy railroad track without stopping, looking and listening.

Two important things to be remembered are indicated in the decision rendered by the Illinois Supreme Court in the recent case of Gunther v. O'Brien Brothers Construction Co., 16 N. E. 2d, 890. The first point is that the mere fact that a county or other subdivision of a state has been benefited through labor or materials furnished to a contractor for use on a public job gives no lien against the property constructed or approved. The lien covers only the money, bonds or warrants due the contractor, and even then is limited by the provisions of the statute under which the lien is given.

So, it was decided by the Illinois court, under the statutes of that state, that where a sanitary district relet a sewer job to the lowest responsible bidder after the original contractor had fallen down on the job, the district was entitled to be made whole on what it cost to complete the sewer, even though this resulted in loss to those who had furnished labor and materials to the defaulting contractor. (Of course, the labor and material claimants could have protected themselves against the loss by insisting upon a good bond from the contractor.)

The court further noted that the courts generally hold that a municipality does not render itself liable to third parties who have furnished labor or materials to the contractor, through neglect to require the contractor to furnish a statutory bond for their protection.

### Checks as Final Settlement

When a contractor receives a check which seems to indicate that it is intended as final payment for a job, he will do well to proceed cautiously in the matter of cashing the remittance, if he has any idea of claiming that some additional sum remains due. There are three kinds of checks: (1) the kind that are so plainly a tender in final settlement under a contract as to leave no doubt that cashing them will foreclose any further claim under the contract; (2) the kind that, for want of specific tender as final settlement, will not bar further claim; (3) the is-it-fish-or-is-it-fowl kind that judges and lawyers must debate about before its character can be determined.

In the third class we put the check that was given a contractor after he had finished a state highway job. A trial judge said that the check barred any further claim, but the Mississippi Supreme Court said that it did not, thereby nullifying the lower court's ruling. (Wunderlick v. State Highway Commission, 184 So. 456). In this case, there was no recital on the check, but it was issued pursuant to a voucher and an accompanying "final estimate". The voucher stated that the check was issued "in full settlement of claims and accounts listed herein," etc. Since this did not cover a claim

by the contractor for damages arising from the Commission's delay in furnishing rights-of-way, the Supreme Court decided that receipt of the check did not bar enforcement of that claim. The court said that when a remittance is sent as full payment of an itemized account, receipt and cashing of the check is a final settlement only as to the items specified, although the items not covered grow out of the same contract as the items covered.


### Gambling on Excavation

"We invite you to bid on a road job that will involve moving 98,254 yards of earth and 54,850 yards of rock," said the State Highway Commission of Kansas. But the bidders were required to sign statements to the effect that the Commission did not guarantee the accuracy of its estimates of earth and rock to be moved, and that a contract awarded at a unit price should "include any and all excavation encountered on the work regardless of the classification shown on the plans." In addition the contractor signed an admission that he had examined the site and was satisfied as to "all quantities and conditions."

When the job was finished, it was found that only 87,518.6 yards of earth had been moved but that 93,386.4 yards of rock had been handled. For the entire job, covering

341,537.7 yards of all kinds of excavation, as against 325,948 yards estimated by the plans, the contractor was paid \$102,461.31, computed at 30 cents per yard. Claiming that he had been misled as to the nature of the work required, he sued to recover \$19,142.41 additional compensation. This figure was arrived at by valuing the rock excavation at 75 cents per yard.

The contractor lost out in the district court in Topeka and, on appealing, had no better luck before the Supreme Court. At the end of a lengthy opinion, the higher court said (Scherrer v. State Highway Commission, 80 Pac. 2d, 1105) that if the contractor had not sufficient time in which to explore the site before he bid, he should have either refused to bid or asked for more time. "Having seen fit to go ahead and bid," he tied himself to whatever subsurface surprises remained in store for him.



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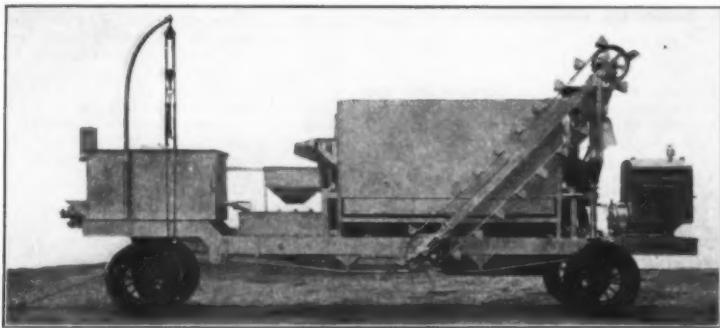
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The White Model L-4 Portable Repair Truck

### Portable Repair Trucks

Announcement has been made by the White Mfg. Co., Elkhart, Ind., of two new models of portable repair trucks for use in the maintenance of bituminous pavements and in resurfacing concrete or brick pavements. Model L-4 has a capacity of 4 tons an hour and Model L-8 has a capacity of 8 tons an hour.

The principle of operation of these two machines is the same, although there is some difference in design. The Model L-4, shown in the illustration, is equipped with an aggregate dryer consisting of a 34½-inch x 6-foot rotating drum mounted on SKF bearings, with internal cascading shelves. It is enclosed in an asbestos-lined housing and has four self-generating oil burners. The pug mixer is of 500-pound batch capacity with a single axle mounted on roller bearings and has a bottom discharge. A White Fire-Proof tar kettle of 165-gallon capacity is mounted at the front end. The cold loading bucket elevator is pivoted to swing up alongside the dryer when traveling. Measurement of material is by an accurate volumetric hopper and graduated bitumen trough. A 60-gallon fuel tank with a rotary-type engine-driven pump supplies the burners. This model is powered by a 20-hp 4-cylinder industrial gasoline engine. The chassis has a steel frame, rigidly braced, with semi-elliptic springs, Timken bearing wheels and four pneumatic tires.

Model L-8 has a 36-inch x 8-foot rotating dryer of the internal fired type. It is mounted on roller-bearing trunnions, has cascading shelves and a center cross flight to increase the amount of steel on which the material is dried. The pug mixer has a capacity of 750 pounds and the tar kettle, 200 gallons. This unit is equipped with a 32-hp industrial gasoline engine and a 34-cfm air-cooled compressor. The dryer discharge chute, mixer discharge gate and aggregate-measuring hopper discharge are all air operated. This model is also mounted on pneumatic tires with Timken bearing wheels and semi-elliptic springs. Both of these machines are within the limits of road clearance for operation on state highways.

### New 23-Yard Scraper

The new Model W Carryall, recently announced by R. G. LeTourneau, Inc., Peoria, Ill., and Stockton, Calif., is a single-bucket scraper rated at 23 cubic yards heaped capacity. This extra-capacity Carryall has been designed especially to take full advantage of two

tractors' horsepower for loading and one D8 tractor in hauling. Although the Model W is particularly adapted for pusher work, it can be loaded without the aid of a pusher when favorable grade loading permits.

Among the features of this new Carryall are the large single bucket, special alternately curved and straight cutting blades placed at a plow-like natural-

suction digging angle, a positive ejection tail-gate that quickly cleans the bowl, and a new large sheave arrangement designed to reduce cable strain, facilitate load handling and keep dirt out of the sheaves and the cable. The huge bowl measures 10 feet deep, 10 feet wide and 5 feet high. The extra high sides retain the spill usually wasted over the edge in loading. It is equipped with eight 18 x 24 special pneumatic tires. With the LeTourneau power control unit it is possible to secure regulated fractional-inch cutting up to 12 inches and to spread loads any required thickness up to 18 inches, according to the manufacturer.

### Bulletin on Diesel Engines

The Truck Sales Dept., Dodge Division, Chrysler Corp., Detroit, Mich., has issued an illustrated booklet entitled "Dodge and Diesel" which explains and illustrates with drawings what the diesel engine is and how it operates as compared with the conventional gasoline engine. Facts about the full diesel and the

semi-diesel, and 4 and 2-cycle diesels are given as well as information on the diesel engine developed by Dodge. Copies of this booklet may be secured from the Dodge Division without cost by mentioning CONTRACTORS AND ENGINEERS MONTHLY.

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## PURPLE-STRAND FORM-SET WIRE ROPE



## Here's what FORM-SET means

IN WIRE ROPE, individual wires and strands form a helical or screw pattern in the complete rope. Ordinarily these individual wires and strands are straight before entering the stranding and closing dies. They are forced into this helical shape and held there by seizing at the end of the rope. Remove this seizing, and strands fly apart from internal pressures.

By pre-forming rope, strands can be formed into this helical pattern before or during the closing of the rope. Individual wires are "set" in position at the same time. Result is a rope in which each wire and each strand lies in position without internal tension or pressure. Ends do not require seizing. The line might be termed "relaxed."

Form-Set is such a line. Strands have been pre-formed so that they are relaxed rather than being under spring tension. Not until the rope itself goes to work do the wires come under heavy stresses. As a result, the rope has greater fatigue life. It is easier to handle and break in. It spools better. It is less likely to kink. It resists whipping. Experience has shown that Form-Set gives more ton miles per dollar in spite of its somewhat higher first cost.

The combination of Form-Set construction and Purple-Strand quality gives you as fine a line as money can buy. It is built for the particular job and designed by men who know the conditions to be met. It is produced by a company which has spent three-quarters of a century making fine steel. For these reasons thousands of contractors consider Form-Set Purple Strand the line for heavy jobs.

Bethlehem wire rope is available through distributors. Write Bethlehem Steel Company, Bethlehem, Pa., for the names of wire-rope distributors in your vicinity.



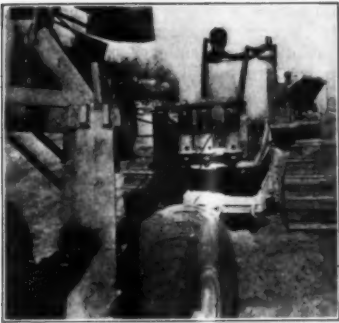
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The New Caterpillar Attachment for Use With Cable-Controlled Tractor Equipment

### New Cable Control For Crawler Tractors

A new cable control attachment to facilitate the handling of scrapers, bulldozers and other cable-controlled equipment used with Caterpillar tractors has recently been announced by the Caterpillar Tractor Co., Peoria, Ill.

The mounting of this new double-drum control unit at the rear of the tractor leaves the tractor drawbar clear, to facilitate attaching and detaching equipment, and also leaves the operator an unobstructed view to the rear. The cable-control levers are conveniently located within easy reach of the operator, the right-hand lever being moved to the left and the left-hand lever to the right to engage the clutches.

Literature describing and illustrating these new cable control units, with full information on their operation, may be secured direct from the manufacturer or from this magazine.

### Small Arc Welder For Repair Shops

A small motor-generator-type arc welder, especially designed for use in contractors' shops or garages and in state and county maintenance depots, has been announced by the Lincoln Electric Co., Cleveland, Ohio. This new welder's self-indicating dual continuous control, available for the first time in so small a unit, and its uniform welding current for speedy welding of all metals and alloys make this unit particularly adaptable for installations where handy portability and versatility are required.

Known as the SA-150, this welder has both job selector and current control calibrated and equipped with dials which indicate the type of work and number of amperes for every setting. Both the voltage and current controls are continuous in operation, providing countless possible combinations. According to the manufacturer, this feature simplifies the setting of the control and provides a wide range in types of work, welding conditions, sizes of electrodes and thicknesses of material. Being continuous, the control can be advanced or retarded in increments as fine as desired. At the lower part of its range, the welder delivers a current of

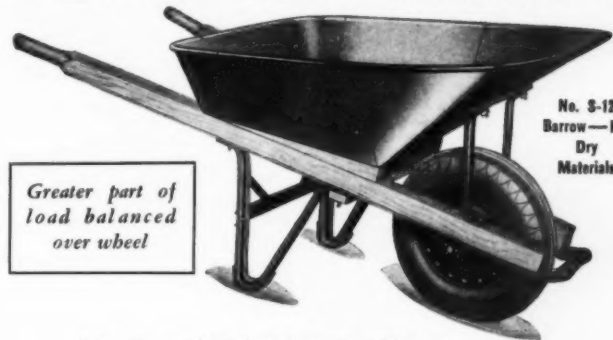
light-penetration characteristics for welding extremely light-gage material while the upper portion of its range delivers ample current for the speedy welding of heavier materials. It may be used with either bare or shielded-arc-type electrodes.

The SA-150 is powered with a Linc-Weld squirrel-cage induction-type motor for across-the-line starting. Connections are readily accessible for either 220 or 440 volts, 3 or 2-phase, 60 or 50 cycles.

### Contractors' Hardware

The Cleveland Steel Specialty Corp., 3775 East 91st St., Cleveland, Ohio, manufacturer of bars, plates, light structural steel and sheet metal, has issued a booklet which contains descriptions, illustrations and prices of its products, including Clessco ladder jacks, scaffold brackets and saw-horse fittings recently developed by this company. Copies of this booklet entitled "Price List K" may be secured direct from the manufacturer.

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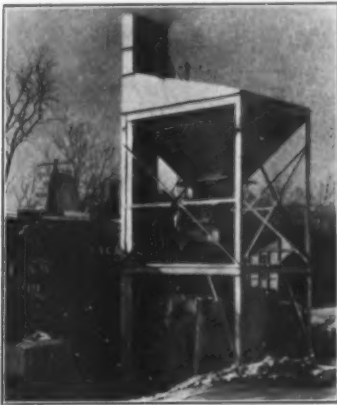
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A Heltzel Portable Bulk Cement Plant  
Powered by a Hercules Model ZXB Gasoline Power Unit

### Bulk Cement Plant Self-Contained Unit

The Model E-1 bulk cement plant, made by the Heltzel Steel Form & Iron Co., Warren, Ohio, is a sturdy, compact and easily portable self-contained unit. The batcher and elevator are built in at the factory and are shipped as one unit completely assembled. In moving the plant from one location to another, it is not necessary to dismantle the entire unit; all that is necessary is to disengage the chain drive and disconnect the screw conveyor. The columns are of one-piece construction, with strength and solidity combined with easy portability. The standard Model E-1 is equipped with a 16-cubic foot batcher for 1½-yard batches. When operations require 2 and 3-yard batches, 20 and 30-cubic foot batchers are available. Where greater storage capacity is required, bolted and gasketed construction permits the addition of extensions to the storage bins. A gasketed air-tight canvas shroud between the rubber tubular valve housing and the batcher is provided for dustless operation.

Power for operating the enclosed screw conveyor, the elevator buckets and a bank of non-clogging air jets at the throat of the bin to prevent arching is furnished by a Hercules gasoline power unit Model ZXB, with a 2½-inch bore and 3-inch stroke. This 4-cylinder engine is mounted on a heavy structural steel base. When the plant is set up for operation, the engine base is staked securely in the ground, eliminating the need for an independent engine foundation.

### Reducing Landslides In Highway Grading

Highway landslides in Ohio are usually encountered in the hills of the eastern section, where a highway cut nearly always exposes clay, shale, soapstone or other potential slipping plane. Those sections containing outcrops of the Pennsylvania formation, with its shales, sandstones, limestones, and to a lesser extent but much more detrimental, clays and coal, are the worst areas.

Soil mechanics has a somewhat limited use as yet in the solution of landslide problems. However, landslides in Ohio can usually be attributed to one or more of the following causes:

1. Improper compaction of a high or hillside embankment, leaving excess voids which eventually fill with water. Sloughing or sliding results from the general instability.

2. Using unsuitable material in the embankment, such as fire-clay, shale with insufficient fines, or highly expansive or micaceous soil.

3. Constructing the highway in localities where fire-clay or underclay occurs either beneath the road or above it (as in a cut). Removing the toe of the hillside slope at the fire-clay layer often starts landslides that are checked

only after the expenditure of a large amount of money.

4. Constructing the highway in formations of plastic clay or clay shale, which are characteristically unstable.

A thorough knowledge of the characteristics of soil, combined with adequate geological information, is necessary before scientifically attacking such a problem. Our experience with highway landslides in Ohio warrants the following recommended procedure for this area:

1. Identify the formation in question and obtain as accurate a geological log of the landslide as is possible.

2. Supplement this information with adequate drillings and obtain representative samples of the individual layers.

3. Test or identify these samples by using the subgrade classifications of the Bureau of Public Roads, making sure to obtain determinations of natural moisture content.

The test data can be used to classify the samples, and a soil profile and cross-section plotted. This procedure will usually make the cause of the slip apparent. Soil mechanics then becomes helpful in recognizing the drainage characteristics of the various stratifications and in judging the degree of suitability of the materials. Adequate and accurately placed drains may solve one case of sliding while complete excavation of the unstable material may be the solution in another. Piles may remedy the situation occasionally, but are not recommended unless complete information indicates that their use is feasible. Embankment slides caused by the use of unsuitable material may have to be reconstructed, while an improperly constructed embankment containing suitable materials may stabilize itself after it has been properly drained.

In the final analysis, perhaps the best measure for preventing highway landslides is to anticipate them in the preliminary layout, either by making light cuts and fills or, if possible, by going around potential landslide outcrops.

From a paper prepared for the American Society of Civil Engineers and published in *Civil Engineering*, Vol. 7, No. 1.

### Portable Air Compressors

Bulletin G2P, recently issued by the Le Roi Co., Milwaukee, Wis., contains illustrations and pertinent data on Le Roi gasoline-driven two-stage portable air compressors which are available mounted on skids, two or four pneu-

matic tires, four hard-rubber tires, four steel wheels or can be arranged for truck mounting. Copies of this bulletin may be secured direct from Le Roi.

### New Snake-Bite Kit

A new pocket snake-bite kit, which enables a man to treat himself successfully after being bitten by a rattler, copperhead or moccasin, has been announced by the Davis Emergency Equipment Co., 55 Van Dam St., New York City, for workers who must enter snake-infested regions.

This kit, which can easily be carried in a vest pocket, contains the following equipment: a tourniquet, which should be applied to the arm or leg immediately above the wound to prevent the spread of the poison through the body; a stainless steel lancet for opening up the fang holes to permit drainage of the poison; a syringe for pumping blood and venom from the wound and which is specially designed for one-hand operation and for

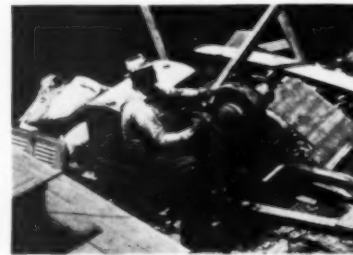
application to wounds in either flat surfaces or between fingers or toes; and also antiseptics, bandages, and ammonia inhalants for use if the victim becomes faint.

Records show that, if the proper treatment is applied promptly by the victim or a companion after a snake bite and is later followed by medical care, recovery may be expected.

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## Mobile Field Shop At Arizona Canal

Tractors Tow Sand Boats  
With Complete Repair Shop  
In Wake of Dragline on  
Coachella Canal Job

By JOSEPH C. COYLE

♦ THE 120-mile Coachella Branch of the All-American Canal will irrigate some 150,000 acres of land in the vicinity of Salton Sea, Arizona, 240 feet below sea level. Some 16,000 acres of this area, where the leading crop is dates, is now watered from deep wells, some of which are artesian and others pumped. The branch of the canal under construction has a bottom width of 60 feet and a water depth of 10 feet, with side slopes of 2 to 1 at the upper end. The width decreases at points where water will be removed for irrigation.

The contract for the first 43 miles of the canal excavation was awarded to the W. E. Callahan Construction Co. and J. P. Shirley for \$382,872. Work was started August 5, 1938, at the turnout some 25 miles west of the company's main office and shops at Colorado Siding, near Yuma. The excavation is all common, and 7 miles of channel, skirting the west side of the sand dunes, had been dug by January. Occasional small patches of hard material have been encountered, where the 16-cubic yard toothless bucket of the 10-W Bucyrus-Monighan walking dragline which roughs out the channel was exchanged for a bucket of the same size with teeth. Backing up, the machine digs one side of the channel to the center line for about 2,000 feet, then walks back for the second cut. Spoil is cast back far enough to provide 24-foot berms.

The channel bottom is finished with a LeTourneau bulldozer on a Caterpillar Seventy-Five, and the slopes with a small Northwest dragline. This machine works one shift only, with a two-man crew. The big dragline operates day and night, with four men on each of the four 6-hour shifts. At night the cut lines are marked with 6-inch red reflectors on short metal stakes. The boom light shining on these reflectors indicates to the operator where to dig.

The contract includes drainage ditches or dikes, or plowed furrows on the uphill side of the canal, as directed, and excavation for compacted lining in places where it is required. Wherever the floor of the desert is less than 6 feet above the water line, unsuitable material is stripped from the 24-foot berms and replaced with material from the channel up to the 6-foot freeboard elevation. The highly abrasive sand in which this excavation is being carried on wears the equipment very rapidly.

### Difficulty of Moving Equipment

The loose sand covering the desert floor along the route of the canal is a decided drawback to moving equipment about. Several inches had to be re-



Callahan's Portable Field Shop on the Coachella Canal Job

moved by bulldozers from the surface of the access road and the same method is followed in preparing a path for the dragline. No truck or car can stay on top of the ash-like surface without oversized tires. A common practice of the contractors and government forces is to strip the fenders and all excess weight from light cars, equip them with over-size tires, and carry a shovel at all times for digging out. A section of canvas hose is fastened to the side of some of

these "sand fleas" to hold the shovel. Thus equipped, and with a minimum of air in the tires to afford more traction, a good driver can get around if he is careful to keep moving in the soft places.

Fuel oil for the dragline is transferred from the distributor's tank trucks to a 7,000-gallon storage tank at the junction of the access road with U. S. 80, and hauled to the job in a Ford V-8 stake truck, equipped with four rear

dual wheels mounting 900 x 18 Good-year tires all around, including the two front wheels. The body carries 15 barrels as well as a 600-gallon tank mounted on a wooden frame at the front end. Additional fuel storage is maintained by spotting a Euclid crawler wagon, with a platform holding 44 barrels, near the field shop. A similar wagon, pulled by a Caterpillar Seventy-Five, services the dragline at times when the stake truck is otherwise employed.

### Handling Repairs on the Job

With the work starting 25 miles from the contractor's base, and with 43 miles of sandy desert to go through, it was obvious that most of the maintenance work must be done in the field. A mobile field office, tool room and repair shop proved the answer to this problem. Two small buildings housing the office and tool room were mounted on broad wooden runners. Two sand boats, 8 feet wide and 20 feet long, with 20 x 15-foot

(Concluded on page 41)

# KOEHRING

*Air Controlled*  
**AUTOCYCLE OPERATION**

Seconds are saved with each cycle of operation. High Speed Production of the Koehring Twinbatch 34-E is made possible because of air-controlled Autocycle operation. Charging, mixing and the discharge are combined in a series of fast, exact and automatic batchmeter timed operations. The batchmeter actuates the air valves controlling the transfer and discharge chutes. A large air storage tank, supplied by an air compressor driven by the power unit, provides sufficient air capacity for all operations.

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Koehring High Speed Twinbatch 34-E Paver, paving a 30 foot wide concrete highway.



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**GIANTGRIP  
STRAIGHTEDGE**

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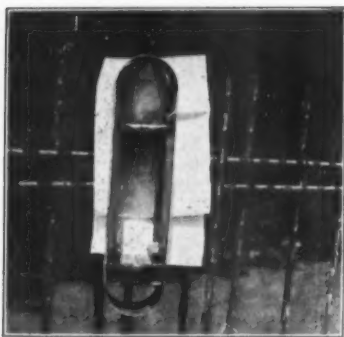
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C. & E. M. Photo  
The Well-Built Form That Made the  
Holes in the Hand Rail to Form the  
Spindles

## Novel Methods Used On Florida Bridge

(Continued from page 15)

could be welded like a stirrup to the flanges of the channel carried turnbuckles for the fine adjustment. In addition, the whole was trussed with  $\frac{1}{4}$ -inch cable. The outfit weighed 600 pounds and was readily handled by six men. It was 40 feet long.

### Hand-Rail Forms

The hand rail which is  $3\frac{1}{2}$  inches thick in the web section and 8 inches thick at the top, or hand rail proper, is of reinforced concrete cast in place with the end posts cast integral with the rail. The end posts are 18 x 10 inches in section and 2 feet  $11\frac{1}{2}$  inches high on top of the curb. The spindles were formed by slots or "windows" in the otherwise solid web of the hand-rail section. These windows were formed by placing special sheet-metal forms between the wood panels within which the hand rails were cast. The windows are 1 foot 5 inches high and  $3\frac{1}{2}$  inches wide with 2-inch radius curves top and bottom.

The metal forms for the slots were in two pieces with two spacers at the spring lines of the semi-circular ends. One of the semi-circular ends locked onto the remainder of the form by means of the spacer; thus, when the form was to be removed, the spacer was pulled with a claw hammer, releasing the main section of the form from the top semi-circular end. When the bottom spacer was pulled then the vertical section and the bottom semi-circular part could be collapsed and removed, making the removal of the top portion very easy. With this patented form there is no damaging the concrete as in removing wood blocks which sometimes swell and make it difficult to get them out. In setting the form it was only necessary to place a half round wooden block top and bottom in a true vertical line to hold the form rigidly in place within the wooden panels. For the finishing of the

semi-circular ends of the windows the contractor had special Carborundum blocks made to the proper curvature for easy rubbing.

The hand-rail panels were assembled in sections to pour one 36-foot length at a time, or the distance between joints inclusive of posts. The panels were braced from a 10 x 10 set on the deck 5 feet from the curb and nailed to a 2 x 6 fitted and wedged into the recessed scupper and with a pin dropping into the 4-inch cast iron scupper to lock it in place. Lengths of 1-inch rod with turnbuckles and hooked ends were used as braces and also for alignment from holes in the 10 x 10 to a single 4 x 6 wale at the top of the wall form. The bottom wale on the panel was double 2 x 4's. On the outside of the form a 4 x 4 top and bottom held the end post forms.

### Concreting Methods

The aggregate for the concrete was purchased delivered to the contractor's 50-ton Butler batching plant set up on the Apalachicola River about  $\frac{1}{8}$  mile from the east end of the structure. The Florida Gravel Co. barged the material in and unloaded it to the batching bins with a Northwest crane. The contractor batched all material for the caps and deck from these bins and hauled to the mixers with three 2-batch trucks.

For pouring the caps a 2-bag Jaeger mixer was set on the ground and fed directly by the batch trucks. The concrete was dumped into rubber-tired wheelbarrows, raised in a wood tower, using a 25-hp Novo hoist, and then wheeled to the forms. This type of equipment was chosen as the wheelbarrows were most easily handled in the space available. The all-powerful handy hoist described under "Old Hurley" below was used to skid the tower along the job.

When pouring slab, the first ten slabs from the east end were poured from the ground, pouring alternate slabs as required by the specifications. Then the contractor reached the swampy section and had to put the equipment on top. For the first ten slabs an Insley steel tower was used to raise the concrete from the mixer, using a  $\frac{1}{2}$ -yard bucket dumping into a 1-yard hopper on the deck. The concrete was rolled to the forms in 6-cubic foot Insley rubber-tired buggies.

When it became necessary to move the equipment to the top a 110-foot ramp was built, supported by locally cut timber and with a pair of runs for the batch trucks. The contractor found that the most economical way to pour the deck slabs was to pour three alternate slabs in one pour, thus making it necessary to buggy the concrete a maximum of five slabs. This required seven buggies but worked out best as it was possible to set up for that number of slabs and complete the work in one day.

For the hand rail the contractor set

up a 2-bag Koehring mixer on the deck, batched the aggregates with a pair of Johnson wheelbarrow scales and used four buggies with three men shoveling from the buggies to the forms and seven men rodding the concrete to prevent any honeycombing or failure of the concrete to run under the metal forms forming the slots or windows in the panel.

The slab was cured for 10 days with 3 inches of sand kept wet and the hand rail was cured for 7 days with burlap kept damp by water thrown on it with buckets. A water tank was maintained on the bridge deck filled by pumping from below and used for the mixer on the deck and for the water for curing.

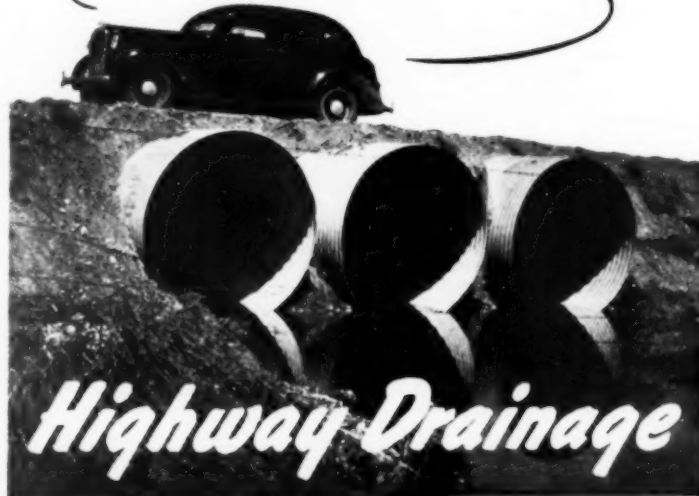
### "Old Hurley"

Almost every contractor has some pet piece of equipment on which he has mounted some gadget or other and of which he is particularly proud. "Old Hurley" was the featured piece of equipment on this job and turned out to be a true roustabout. This nondescript looking piece of equipment consisted of

an old Ford chassis stripped of all evidence of its former service and with a single-drum hoist mounted on the chassis frame by welding. Outside each rear wheel a sprocket wheel was attached with a sprocket chain on each side connected to the single-drum hoist on top. With the rear end of the truck jacked up and the whole machine anchored to a tree stump or a dead-man the single-drum hoist performed miracles. With the addition of a gin pole, it was used to unload all the H-beam piling and the I-beam stringers at the railroad siding; it pulled stumps along the right-of-way; it was used part time to skid the pile driver, to pull up the piles of the temporary trestle, and at the end of construction when the bridge was finally opened to traffic "Old Hurley" celebrated by ripping up the flooring of the old structure by means of a V-shaped sling. Now let R. A. Sey, General Superintendent for the contractor, tell the story of how "Old Hurley" got its name; there's much in a name.

(Concluded on next page)

## WRITING A NEW HISTORY OF



• The ability of GOHI Corrugated Pipe to stand up under the terrific daily punishment of high speed traffic, to resist the destructive action of wear, weather, corrosion, settling fills, alternate thawing and freezing, has set new high standards of quality and written new records of performance. The GOHI fabricator nearest you will gladly give you the facts.

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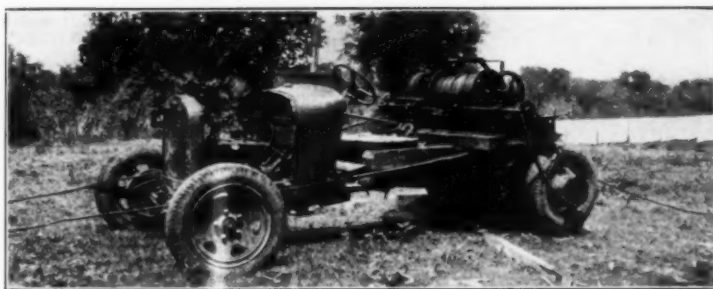


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COMBINED  
IN THE NEW  
MODEL P-A  
PORTABLE  
ASPHALT  
MIXING PLANT**

Write for  
**Particulars**  
**Bulletin T-260**





C. &amp; E. M. Photo

"Old Hurley"

## Truck-Powered Winch Handy on Bridge Job

(Continued from preceding page)

"In this era it seems that something is missing if practically everyone doesn't have a nickname, particularly people who have some outstanding features or peculiarities. On a recent job in southern Alabama, the project extended through a farm owned by an old maid named Hurr. She did all of the farm work herself, working from 'can to can't', and was always seen barefooted and wearing ragged clothes. She was conged by the construction crew to be the ugliest woman on earth. However, in spite of these characteristics, she always produced a good crop and she soon inherited the name of 'Old Hurley' from members of the construction crew.

"You will note from the illustration that the piece of equipment our crew christened 'Old Hurley' has no streamlined figure. However, she was a glutton for work, and produced from 'can to can't' whenever called upon. Some of the men who remembered the old maid Hurley thought this piece of equipment, on account of her looks and reliability, resembled her. She was soon christened 'Old Hurley' and was so known by practically the entire organization."

### Personnel

This contract was awarded to C. G. Kershaw Contracting Co., of Birmingham, Ala., on its bid of \$294,796.74 and work was started on June 28, 1937, with 300 working days allowed for completion. In spite of delays from high water and in the delivery of some of the material the work was completed within the contract limit. For the contractor the work was in charge of R. A. Sey, General Superintendent, and R. J. Arington, Superintendent of pile driving. For the State Road Department of Florida the work was done under the field supervision of W. C. Carter, Project Engineer. J. H. Dowling is State Highway Engineer, E. S. Fraser, Bridge Engineer, and M. N. Yancey, Division Engineer for the Department.

## Heavy-Duty Mower For Highway Use

The Gledhill heavy-duty mower, mounted on four rubber-tired wheels, is designed particularly for use on state and county highways. The rubber-tired front truck carries the mower along evenly and dependably, according to the manufacturer, and is interchangeable with the Gledhill road shaper. The steering gear permits the operator to guide the mower in and out around posts, poles and other obstructions, allowing the motive power, either truck or tractor, to remain on the pavement while the mowing unit can make three full swaths along the roadside. This is done by means of the steerable telescopic pole which can be easily adjusted to three different lengths for first, second and third cut. A 1/8-inch cotter key provides a shear pin to prevent breakage if the mower strikes a solid obstacle. The gear, clutch, countershaft and differential are compactly assembled in an

enclosed gear case in a one-gallon bath of oil. Ball and roller bearings are used throughout, to provide smooth easy operation, long lift and light draft.

The cutter bar is of heat-treated and oil-tempered high-carbon steel, with a slight permanent upward bend to keep the bar level. Steel levers, conveniently located for the operator, control the tilt and lift of the cutter bar, an automatic pawl on the lift lever and the quadrant

teeth on the tilting lever making for easy operation.

Complete information on this Gledhill highway mower is contained in literature which may be secured by state and county highway engineers direct from the Gledhill Road Machinery Co., Galion, Ohio, or from this magazine.

### New Electric Saw

A new electric saw, with a cutting capacity of 2 1/2 inches at 90 degrees and 1 3/4 inches at a 45-degree bevel, has just been announced by the Syntro Co., 227 Lexington Ave., Homer City, Penna. The saw blade is totally enclosed in a telescoping safety guard. An oversize universal electric motor drives the arbor shaft through silent worm gears. Only precision ball bearings are used, three on the motor shaft and two on the arbor shaft.

Literature describing this and other models of saws made by this company may be secured direct from this manufacturer by mentioning this magazine.

## PILE HAMMERS and EXTRACTORS HOISTS-DERRICKS WHIRLERS

Special Equipment Movable Bridge Machinery

Write for descriptive catalogs.

McKIERNAN-TERRY CORP.  
19 Park Row, New York

Distributors in Principal Cities



● Framed in the drawing above is an actual photograph taken on a road contract in West Virginia, and the broken rock in sight is a part of that blasted from drilled holes put in by one Cleveland Drill Rig in two weeks overall time. Holes were drilled 20 feet deep. The rock consisted of strata of sandstone, clay, shale, and limestone, not the easiest drilling in the world, but the holes were put down by the Cleveland machine at the rate of more than 1000 feet per day. The Cleveland's exceptional blowing power, plus the effective means for withdrawing drill steels from the holes, made the job easy sailing all the way through this cut.

Cleveland Drill Rigs will show you something on your job too. Demonstration any time, on your own ground, with your own operator. Ask us to send Bulletin 311.

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LEADERS IN DRILLING EQUIPMENT



Some of the Attachments of the Jack-Of-All-Trades Engine

### Jack-Of-All-Trades Portable Gas Engine

A new 1-hp gasoline engine flexible-shaft unit, with attachments for concrete vibrating, sawing, drilling, grinding, wire brushing, form sanding, and pumping, has been announced by the Mall Tool Co., 7743 So. Chicago Ave., Chicago, Ill. The unit, in which power is developed by the gasoline engine and delivered to the tool through the heavy-duty flexible shafting, is light in weight, powerful and easily portable, according to the manufacturer. It can be carried up a ladder by one man and placed on a scaffold or in confined places. It can also be operated while suspended from a rope or hook.

If desired, the power unit and vibrating attachment only may be purchased, or as many of the other attachments as are desired can be purchased separately. A new bulletin describing the Jack-Of-All-Trades may be secured direct from the manufacturer or from this magazine.

### Wire Rope Bulletin

Correct handling of a wire rope, both before and during its use, is very essential if the best results are to be obtained. A. Leschen & Sons Rope Co., St. Louis, Mo., has recently published an informative booklet offering suggestions for the general improvement of all wire-rope service, covering unloading and moving, storage, uncoiling and unreeling, etc., and containing illustrations showing the right and wrong methods. Copies of the bulletin may be secured direct from the manufacturer without charge by mentioning this item.

### New Electric Plant Is Fully Enclosed

A new 2,250-watt two-cylinder water-cooled alternating-current electric plant, known as Model 35-A, has been announced by the Kato Engineering Co., Mankato, Minn. The complete plant, which is fully enclosed, includes a gasoline engine, generator, oil-bath-type air cleaner, muffler, hand crank and standard outlet box.

The generator is of the self-excited revolving-armature, 110-volt 60-cycle single-phase type and is mounted on the engine flywheel housing with the armature mounted on the engine flywheel. Power is furnished by a Stover 4½-hp two-cylinder four-cycle gasoline engine with 2½-inch bore and 2¾-inch stroke, equipped with a Wico high-tension magneto with impulse coupling, an accurate mechanical governor, diaphragm-type fuel pump and 5-gallon fuel tank, New Departure ball main bearings, and aluminum alloy connecting rod with renewable bearings. It has constant level splash lubrication with a 3-pint oil capacity.

Direct current models, known as 35-DC and 35-C, furnishing 2,250-watt 32-volt direct current and 2,250-watt 110-volt direct current respectively, have the same general specifications as the alternating-current model described above. These models are furnished at 220 and 230 volts at no extra cost.

### Paymaster Crane Now Truck-Mounted

The Lima Type-34 Paymaster, made by the Lima Locomotive Works, Inc., Shovel & Crane Div., Lima, Ohio, is now available with motor-truck mounting. The standard crane boom is 35 feet long and in two sections of alloy steel cord angles, pin connected.

The rotating frame upon which the main machinery is mounted is cast in one piece. Hook rollers rotating between a double integral roller path are designed to prevent the rotating frame lifting away from the base or turntable. The base casting is securely bolted and welded to the truck chassis which is thoroughly reinforced to withstand the shock imposed upon it. Weight has been kept to a minimum through the use of high tensile steel and by placing the machinery at the extreme rear of the revolving frame.

The boom hoist is a separate unit mounted on the rotating base casting and is independent in operation. The raising or lowering of the boom is accomplished through an internal expanding friction clutch and a friction brake. For additional safety a ratchet and dog



A Lima Truck Crane with a 50-Foot Boom, Owned by Harris Structural Steel Co., Inc., New York, Demolishing the Sixth Avenue Elevated in New York City. Some of the Trusses Handled Weighed Approximately 4½ Tons. In Some Cases It Was Necessary to Operate the Machine at a 35 or 40-Foot Radius.

is provided and is controlled from the operator's station. For special crane service a worm-driven boom hoist is available at a slight additional cost. Power for the Paymaster is furnished by a 6-cylinder 4¾ x 4¾-inch gasoline engine with silent chain drive to the jack shaft. Diesel power is also available. The unit is equipped with modern anti-friction bearings at each vital bearing point, including the drum.

Special attention has been given to the comfort of the operator. The levers which control the various operations are all located within the cab and are of short easy throw. An extra-wide bus-type seat is provided and the wide-vision cab has a winter front which is so designed that it can be housed in the top of the cab when not in use and is easily lowered or raised with one hand.

Copies of Bulletin No. 34 containing complete information on this new Paymaster truck crane may be secured direct from the manufacturer or from this magazine.

## There's Not Another Manufacturer Who Can Offer You ANY ONE of These Exclusive Features WITH HERCULES YOU GET THEM ALL

1. Center-Lift, Super-Power Hydraulic Hoist.
2. "Tire-Tool" Pack Dump Bodies—a spacious weather and theft-proof compartment built-in under body.
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New CMC End Discharge 3½ Non-Tilt. Also 3½ End and Side Discharge Tilters.

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GAS OR DIESEL

Write today for Bulletin  
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## Buy a HUBER

ROLLERS GRADERS • INDUSTRIAL TRACTORS • HIGHWAY MOWERS





## (Continued from page 37)

A total of 30 men are employed on this job, with V. H. Gray, Construction Superintendent for the contractor.

Westinghouse gearmotors, which are self-contained drives consisting of a high-speed Westinghouse motor and necessary speed-reducing unit, are de-

A volumetric batcher wheelbarrow, designed to give the same control of quality of concrete from ground storage on small jobs as is secured on large jobs, is now being made by the Concrete Pipe Machinery Co., Sioux City, Iowa. The barrow consists of a steel tray mounted in a tubular steel frame with a ball-bearing-equipped pneumatic-tired wheel. The large 4:00/7 tire prevents the barrow sinking into the soft ground or sand around the storage piles, and the location of the wheel rather far

The forward part of the tray has a capacity of 2 cubic feet and the rear vertical section of the wheelbarrow is so arranged that any one of seventeen positions are available to give the exact volume desired. Thus, sand or gravel

Further details on this new wheelbarrow may be secured by those interested direct from the manufacturer by mentioning this item, or from this magazine.



BINS, Portable and Stationary  
CEMENT BINS, Portable and  
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CENTRAL MIXING PLANTS  
BATCHERS (for batch trucks or  
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dial or beam scale)  
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and integral curb attach-  
ments)  
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TOOL BOXES  
FINISHING TOOLS FOR CON-  
CRETE ROADS

## Why NOT an Etnyre!

● **PERFORMANCE**  
*Sold it...*



C. & E. M. Photo  
A 30-Inch Concrete Pipe with Native Limestone Headwalls on an Access Road

## Roadside Work Made To Pay in Alabama

(Continued from page 18)

grade beneath the roadway.

On a long sidehill cut on a vertical curve another problem came up. The ground water was coming out onto the surface of the cut and starting erosion. This was checked by combining the surface drain and the subsurface drain. The section beneath the surface drain was excavated to a depth of 3 feet and the bottom 1½ feet filled with slag to check the flow of the ground water. Then on top was the paved surface drain of field stone. The subsurface drain was tapped at the bottom where it reached the inlet with a 6-inch tile.

Throughout this work wherever the slopes, when laid back to a 4 to 1 natural slope, cut through tree root systems, walls of field stone were built around the roots to protect them. Also, where the brush had been cleared to give a more open appearance to the right-of-way, dogwoods were scattered among the remaining trees.

### New Ditches for Old

At another location where the old ditch for surface drainage had cut a deep slash in the side of the hill, the engineers moved the ditch back to the top of the slope on two adjacent cuts, placing it almost at the edge of the right-of-way. In this manner the ditch was taken from the slope, which was back-filled with good material and sodded to a uniform slope, and placed out of sight. The two new surface ditches met in a paved inlet which opened onto a paved spillway leading to another inlet at the side of the road.

### Honeysuckle to the Rescue

Honeysuckle vines have been used to good advantage to check the erosion of

railroad fills where they cross the roadway with long single-span girders. After every rain it had been necessary to send out a maintenance crew to mop up by shoveling the dirt that had been washed down the edge of the wing walls of the abutments. This has been checked quite definitely by the planting of honeysuckle vines at intervals of 2 feet over the slope and fertilizing the new vines with 10 pounds of compost in each hole, purchased from a local dairy at \$1.50 a ton.

### Water Moved from Gutter to Ditch

To promote safety and reduce maintenance cost, the roadway on U. S. 11 entering Bessemer was widened and foot paths constructed along the edge of the widened shoulders. The earth shoulders along the concrete pavement were widened to 13 feet and a 4-foot foot path constructed along the outer portion. A shallow gutter between the foot path and the edge of the pavement collects the water from the roadway surface. This gutter, being shallow and grassed, serves as an area for parking vehicles off the pavement.

As the water would gather very rapidly in this section because of the width of the pavement and as the surface drain itself could not be large, spillways were built in at 300-foot intervals. These consisted of small concrete catch basins with a header wall 2½ feet wide, 12 inches high and 6 inches thick with an 8-inch tile carried beneath the sidewalk to a concrete spillway to the regular drainage ditch at the foot of the 4 to 1 slope. This drainage ditch itself was dug on a uniform grade so as not to pond the water at intervals as is so common in highway drainage. The 4 to 1 slope was sodded horizontally to act as a check on wash of the slope.

### Bad Roadside Hazard Removed

A deep drainage ditch that ran along the old road and which had been the cause of several bad accidents was removed by building a double 5 x 5-foot culvert in the ditch and roofing it over with an 8-inch reinforced concrete slab. The culvert itself was built of rubble masonry as are many of the headwalls of access roads throughout the project. Not only are the field stone rubble walls more natural and attractive but the cost is only \$7 to \$8 per cubic yard instead of the \$16 to \$18 for the concrete.

### Personnel

The work on the Birmingham-Bessemer Road was in the Birmingham District, Robert D. Jordan, Division Engineer, and Theo. Massey, Resident Engineer. Both the Bessemer project and the work north of Birmingham, for which Mr. Massey was also Resident



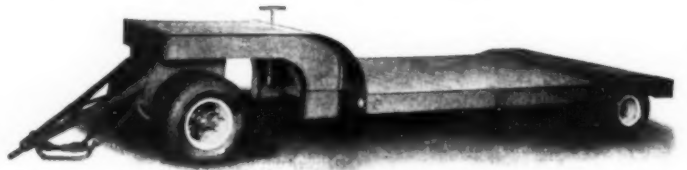
C. & E. M. Photo  
The Open Ditch in the Foreground Was the Scene of a Fatal Accident. In the Background is a Double 5 x 5-Foot Concrete Culvert Being Extended to Replace the Open Ditch

Engineer, were WPA projects. The former employed some 650 laborers on roadside work alone during the winter of 1937-38 when the so-called "recession" hit the Birmingham District severely.

Engineering is the art of the economic application of science to social purposes.

—Gano Dunn, President, J. G. White Engineering Corp.

## ALL TRAILERS are NOT ALIKE!



IF YOU are to be completely satisfied in the operation and service of the trailer you buy, you should inspect its mechanical construction carefully. Are the beams strong enough to carry the rated capacity without sagging, after several months' service? Does it have bronze bushings on radius rods, brake cross-shafts, and all other points requiring lubrication? Does it have oversized, tapered roller bearings in all wheels? Does it include complete equipment? These are just a few important details to look for in your next trailer.

The new 6-wheel, 20-ton JAHN trailer shown here is typical of the entire

line of QUALITY trailers now being built. This new heavy-duty model is convertible to a semi-trailer without any mechanical changes, by simply removing the front dolly assembly, (king pin fits any standard semi-automatic fifth wheel). Other important features include deep wide flange main beams, numerous cross members and gusset plates, spring mounted front dolly, internal expanding brakes and the latest development in positive brake equalization.

Before you buy any trailer, check the exclusive advantages found only in JAHN SUPER-BUILT TRAILERS. Write for details.

**C. R. JAHN CO. 1347 W. 37th PLACE, Chicago, Ill.**  
"COME TO TRAILER HEADQUARTERS"

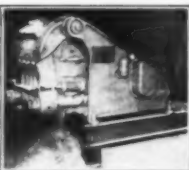
## KUE-KEN BALANCED CRUSHERS

MAKE THIS Into THIS IN A "SINGLE PASS"!



If you want large reduction ratios KUE-KEN crushers are the only machines that can take large rocks and crush them fine in a "single pass." For primary and secondary crushing KUE-KEN crushes faster and finer with far less power. The new "KUE-KEN crushing principle" eliminates abrasion—the greatest cause of jaw plate wear. KUE-KEN design makes possible low bearing pressures and abundant clean, cool oil-bath lubrication. These guarantee long life to operating mechanism. Send today for Bulletin 600 describing several sizes available and details of free crushing test service.

NO OTHER CRUSHER CAN EQUAL THIS!



Crusher under full load. Perfect balance and light weight eliminates need of heavy foundations. May be mounted on trucks, tall bins, etc.

**STRAUB MFG. CO.**  
532 CHESTNUT ST., OAKLAND, CALIF.

Standard for Half a Century—

TANDEM MODELS  
From 2 to 21 Tons

# Buffalo-Springfield

GASOLINE OR DIESEL POWERED

3 WHEEL MODELS  
From 5 to 14 Tons

Full Details will be sent upon Request

3-AXLE TANDEM

The Buffalo-Springfield Roller Co. SPRINGFIELD OHIO, U.S.A.





The Worthington Highway Chieftain

## Highway Mowers

The Worthington Highway Chieftain, made by the Worthington Mower Co., Stroudsburg, Penna., is a complete tractor and sickle bar mowing unit equipped with horn, front and rear license-plate holders and double extra knife section holder as standard equipment. Power is furnished by a Chrysler industrial-type 6-cylinder gasoline engine with forced-feed lubrication and truck-size radiator. The transmission is the standard heavy-duty Dodge truck selective type, with four speeds forward and one reverse. Travel speed with the bar raised is 32 mph.

The cutter bar is a 5-foot knife of all-steel construction operating through a power take-off and Pitman rod, with a degree of cut 45 degrees above horizontal and 35 degrees below. The bar can be locked in horizontal position or allowed to float above or below the horizontal. An automatic safety device is provided for disengaging the power take-off instantly when the cutter bar reaches an angle greater than 45 degrees. The tilting lever, lifting lever, gear shift for the power take-off and all regulating devices are operated from the driver's seat.

The Worthington Highway Ranger, another type of mower made by this company, has the same features as the Highway Chieftain, plus three rotary-type cutting units for the short grass of boulevard strips, grassed shoulders and landscaped areas. This unit has a hydraulic-lift attachment for raising the three 30-inch cutting units out of engagement with the ground for transportation purposes or when using the sickle bar for longer grass.

An 8-page bulletin on Worthington

highway maintenance equipment may be secured direct from the manufacturer by mentioning this magazine.

## Special Teeth for Excavating Units

H & L specially designed teeth for shovel dippers, dragline buckets, road rippers, scarifiers and trenching machines are made by the H & L Co., 2322 Laura Ave., Huntington Park, Calif., of high-grade rolled alloy steel, heat treated, to provide maximum toughness and resistance to breakage and wear. Another feature of these teeth is their special design, providing a sharp point for maximum digging efficiency.

These teeth are available in various types, including dragline bucket teeth with bolt-on, rivet-on or weld-on bases, a boot-type adapter with point for rippers, a stake pocket type of adapter with tooth attached for either shovel dippers or dragline buckets, shanks and points for all types of graders and scarifiers, and adapters with point attached for practically all makes of trenching machines.

Literature describing the H & L line of special points for excavating equipment may be secured direct from the manufacturer by mentioning this magazine. It is recommended that, in writing for information, the type and make of excavating equipment be specified.

## Operating a County Garage

Hancock County, Ind., purchased its highway garage buildings about 8 years ago. The buildings, which are of brick, include a garage 50 x 100 feet and a 30 x 50-foot shop. All equipment is kept in the garage building, while the shop is used for repair and maintenance work, including the painting of signs and mixing the patching materials for black-top roads. Much of this work is done on rainy days when it is impossible to work out-doors and it has been found that mixing gravel with the bituminous material and stockpiling it in the shop has enabled the men to make better time on repair jobs when the weather is favorable for such work.

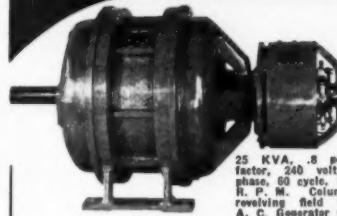
The shop is equipped with a welding outfit, cutting torch, air compressor, vise, anvil, and a work bench with a rack for all kinds of small repair parts such as bolts, spark plugs, etc. In describing the Hancock County garage at the Twenty-Fifth Annual Purdue Road

School, Oscar H. Fuller, County Road Supervisor, explained that they had found it unnecessary to carry a large supply of repair parts, inasmuch as they are within 20 miles of Indianapolis, and needed parts may be secured from there in two hours' time. One me-

chanic works in the shop and is available for emergency calls at any time.

All county employees report for work at 6:30 a. m. and begin at once to get the equipment ready, leaving the garage at 7 a. m., and working until 4:30 in the afternoon.

## COLUMBIA A. C. GENERATORS

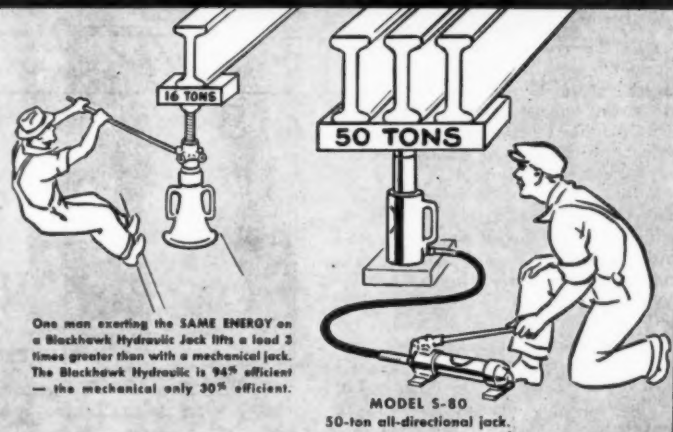


SIZES: 1 TO 300 KVA.  
SPEEDS: 1800, 1200, 900, 720, 600, 514, 450 R.P.M.  
SHIPMENT: ONE WEEK TO 10 DAYS.

Driven by Diesel or gas engine, Columbia Generators furnish power and light where current is not available and are used for stand-by service in event of power failure. Compactly built, they are easily portable. Write for bulletin describing their dependable construction.

COLUMBIA ELECTRIC MFG. CO. 4510 Hamilton Ave., Cleveland, Ohio

## IT'S THE EXTRA-EFFICIENCY OF BLACKHAWK "Hydraulics" that COUNTS in Construction Work!



BLACKHAWK'S famous, sturdy, dependable hydraulic jacks are unequalled for quick, smooth, powerful action. Small and compact — one man can carry, position and operate any Blackhawk Hydraulic Jack. Yet with all their advantages, Blackhawks compare favorably in price with the big, clumsy, hard-to-handle mechanical type jacks.

## SAFE — ONE MAN OPERATION

All Blackhawk Hydraulics provide giant power under finger-tip, precision control. One man can operate any one of them at capacity. SAFE . . . there can be no sudden dropping of a load as happens when a mechanical "shears" a tooth. And Blackhawks give 94% operating efficiency as against 12% to 30% efficiency of average mechanical type jacks. This is true of the full range of Blackhawk's 1 to 75 ton hydraulic

hand jacks, as well as the special all-directional hydraulic rams offered with 10, 20, and 50-ton remotely controlled units and 7 to 75-ton gauge-equipped jacks in the complete Blackhawk line.

Write for data on Blackhawk products as applied in general and special construction and engineering work.

A Product of  
**BLACKHAWK MFG. CO.**  
Dept. J1859 Milwaukee, Wis.



MODEL E411 — 10-TON HAND JACK — Built for heavy-lift work yet weighs only 48½ lbs. Hydraulic lift, 6½" total height, 17½" Users net, only \$35.00. (Slightly higher in West and Canada).

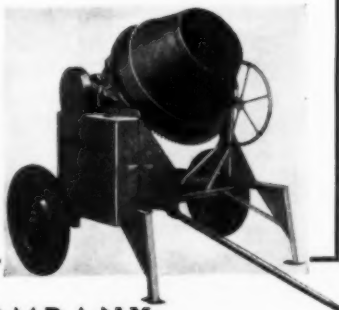
## LANSING

## 31½ E. D. TRAILER MIXER (End Dump)

**new**

This new Lansing Trailer Mixer is faster, more compact and easier handled. Its overall length is only 57" and entire width 68", with a height of 65".

It has a convenient shoveling height of only 42½", with a 31-inch drum. Sturdy 1½" axles, and 26" wheels with pneumatic tires. Weighs only 950 lbs. Write or wire NOW for complete information.



## LANSING COMPANY

LANSING, MICHIGAN

CHICAGO NEW YORK BOSTON PHILADELPHIA MINNEAPOLIS  
KANSAS CITY SAN FRANCISCO LOS ANGELES

# BLACKHAWK

WORLD'S LARGEST MANUFACTURER OF HYDRAULIC JACKS

## N. Y. Subway Tunnels Through Bad Material

(Continued from page 31)

knife would go in between the flanges.

### Packing, Grouting, Caulking

When the shield was working in earth, dry pea gravel was shot under 100 pounds air pressure behind the cast iron rings as the shield advanced during a shove to fill the void created by the advancing tail of the shield, and thus prevent the earth from falling in against the rings before grouting could solidify the section. One 1½-inch grout hole was provided in each A and B segment. One-to-one grout was forced through these holes in 50-foot sections when the tunnel was in rock. Dams were built at this interval by pulling forward the last two rings after the shield had been advanced an extra shove and no iron built, and then the dam was built behind the third ring, and the last two rings forced back into place. The grouting crew consisted of a foreman and two men, using a Ransome pneumatic grouting machine operating under 100 pounds pressure and using the same 2-inch hose as was used for the pea gravel packing.

The joints were caulked, after careful cleaning, with strip lead driven in by an Ingersoll-Rand caulking tool and then sealed over with a neat cement paste before the final cleaning and concreting of the tunnel.

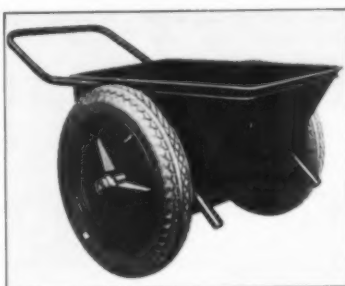
### The Accessory Plant

The complete power plant, including high and low air compressors and the Watson-Stillman pumps and accumulators for the hydraulic system operating the shield, were described in detail on page 22 of the May 1938 issue of *CONTRACTORS AND ENGINEERS MONTHLY*. The plant described below is that operated under air and acting as accessory to the main operating equipment.

In order to provide adequate communication to facilitate operation, as well as to insure the safety of every man working under air, and the operation and passengers of the Hudson & Manhattan Railroad, six telephones were installed in the compressed-air section. On the pressure side of the muck-lock there were two magneto telephones, one merely to communicate with the other end of the lock in open air, and the other to the top of the shaft. A third magneto telephone was connected to the dispatcher's office of the Hudson & Manhattan Railroad, who was notified before every blast in the subway so that trains could be held during a blast as a safety measure. Three additional telephones were installed close to the heading and moved ahead as the shield progressed. One of these, a magneto telephone, communicated direct with the gage house, a second magneto telephone had a direct wire to the Board of Transportation Field Office at the head of the shaft, and the third was a standard dial-operated telephone.

Among the other interesting features in the compressed air were the redesigned switch angles on the run-around at the muck-lock and for the spur track at the heading. The standard switches furnished by manufacturers of industrial railway equipment would not permit getting the siding inside of this small tunnel. The contractor redesigned the switch with a sharper angle and it operated successfully throughout the job without derailment. Some 100 feet back of the spur line at the heading a derail was installed and held open at all times by a spring, so that it had to be thrown by the brakeman when the cars or locomotive were operated over it. This was necessary because in most of the sections the grade from the shield was downhill

(Concluded on next page)



The Red Star Concrete Cart

### New Concrete Carts With Pneumatic Tires

The Model B, equipped with pneumatic tires, has recently been added to the line of concrete carts made by Red Star Products, Inc., 12910 Taft Ave., Cleveland, Ohio. This model is designed for heavy duty and is made in two sizes, a 6-cubic foot and a 9-cubic foot size. Its features include a heavy pipe axle with Timken bearings, sealed wheel hubs, an eye bolt for a tow hook, front legs for clean dumping, and a smooth water-tight lap-welded hopper. The Red Star disk wheels are equipped with straight-side 4.00 x 18 pneumatic tires.

Complete information on these new

pneumatic-tired concrete carts may be secured direct from the manufacturer.

### Road and Curb Marker

The Saf-T-Eye road and curb marker, a product of the Phoenix Glass Co., Monaca, Penna., is made of crystal glass surfaced at the back with permanent aluminum coating. It is embedded in the road with a grout, composed of 1½ parts of sand to 1 of cement. The marker may be used by itself, or with a metal guard of malleable iron which has practically flush contact with the road surface and tapers to a maximum of 11/16 inch above the road surface at the highest point. The manufacturer claims that the small projection of these traffic markers above the road surface results in non-interference with snow plows.

The Saf-T-Eye is of the unitary double reflecting type, capable of reflecting in two opposite directions simultaneously from two oppositely directed light sources, one light source and its reflection being independent of the other light source and its reflection. Multiple reflecting surfaces are provided to reflect light from close-range as well as medium and long-range sources. The metal reflecting medium has a tenacious contact with the glass and has an oxidized aluminum exterior surface. Since the

## UNION HAMMERS

on the "main line"



Getting the piles down on schedule may be a life and death matter on a railroad job. Getting them down ahead of schedule is unquestionably profitable on every job. Hence the swing among contractors and railroads in general, to Union Hammers.

Interchangeable bases assure better penetration and prevent damage to pile heads whether they be precast, concrete, wood, or steel beams, sheeting or pipe.

Write today for Bulletins to

**UNION IRON WORKS**

INCORPORATED

P.O. Box 18

ELIZABETH

NEW JERSEY



● Heltzel heavy duty battered curb forms are the simplest to set and fastest to strip because all stakes are driven straight down. Catalog S-20-F.

**HELTZEL** STEEL FORM & IRON CO.  
WARREN, OHIO, U.S.A.

**Heltzel**  
BUILDS IT BETTER

BINS, Portable and Stationary  
CEMENT BINS, Portable and Stationary

CENTRAL MIXING PLANTS  
BATCHERS (for batch trucks or truck mixers with automatic dial or beam scale)

BITUMINOUS PAVING FORMS  
ROAD FORMS (with lip curb and integral curb attachments)

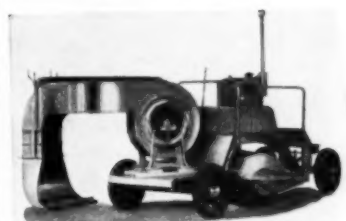
CURB FORMS  
CURB AND GUTTER FORMS  
SIDEWALK FORMS

SEWER AND TUNNEL FORMS  
CONCRETE BUCKETS  
SUBGRADE TESTERS

SUBGRADE PLANERS  
TOOL BOXES  
FINISHING TOOLS FOR CONCRETE ROADS

lens and reflector maintain a definite and permanent relationship to each other under all conditions, there is only one refractive medium involved.

Literature describing the Saf-T-Eye, which is available in glass of other colors, may be secured direct from the manufacturer by mentioning this item.



Hough-Universal Sweeper-Blower



Hough Tractor Sweeper



Engine Driven Road Sweeper



Traction Driven Road Sweeper



Hough Tractor Sweeper-Blower

Consider the Cost and You'll Buy a Hough

Five Sweeper-Blower Models from Which to Choose

For sweeping or blowing the dust and fines from bituminous road bases—before applying the prime or seal coat. On black top and other retread jobs, there's nothing that'll save time and cut costs like a Hough Sweeper-Blower; Traction Driven, Tractor or Truck-Towed Models—all do a fast, thorough cleaning job, require a minimum of space and power and are easily operated by unskilled operators.

Hough Sweepers are widely used for all sweeping and clean-up purposes by contractors, municipalities, state and county highway departments.

Get the facts today—send for Bulletins 110, 111 and 113.

THE FRANK G. HOUGH CO.

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**HOUGH**  
Since 1920

\* **HOTEL CHELSEA**

For Recreation Or Relaxation Choose the Chelsea

Here you will find everything to further your comfort and enjoyment—outside ocean view rooms... sun deck... beautiful dining room at the ocean's edge... superb cuisine... varied sports... and entertainment. You'll like your fellow guests... and the delightfully friendly atmosphere of The Chelsea.

SPECIAL WEEKLY RATES

ATLANTIC CITY



## Safety Under Air In Subway Tunnel

(Continued from preceding page)

and a runaway car striking the open muck-lock would have been disastrous. To insure continuity of operation and a convenient working place for the pipe fitters, a bench was installed just behind the operating platform and completely equipped for odd jobs, including the extension of all of the pipe lines toward the heading as the shield advanced. Close by this bench a two-drum air hoist was installed and was used for raising and lowering a steel blasting mat which protected the shield when shooting in the bottom drift and also for snaking large rock out of the heading.

Safety was given far more than the usual thought by this contractor. Four evidences of this in particular were noted under air. First, a flap valve on the incoming low-pressure air line, which would close tightly against a rubber gasket if anything interrupted the flow of air through the bulkhead, thus conserving the pressure in the tunnel until the line could be connected up with the duplicate pipe through the heading. Second, a steel ladder from the lower decking to the operating platform at the shield was not merely leaned against one of the tie rods, but metal hooks, carefully shaped so that the ladder could not pull away, had been welded to the uprights of the ladder. Third, we noted two men loading a flat car with 8x8 ties. These were not just piled on the car and then held in place by two men walking on either side, but wedges were laid on the car with the thick sections out so that the pile of ties leaned slightly inward, thus preventing a spill. Fourth, every day the decking in the tunnel section was wet down so that there would be no chance of its igniting from any cause whatsoever.

Another item worthy of note is that the contractor furnishes safety boots at cost to all of the men working on his job. These M.S.A. boots have steel toe-caps which protect the men's feet from dropping timber, steel and car wheels.

### Labor and Hours

The shield in the East Tunnel was started March 28, 1938, and completed its trip northward on July 24, 1938, working four shifts of six hours each per day, exclusive of Sundays and holidays. In the West Tunnel the shield was started on November 30, 1938 and will complete its trip of 1,045 feet about June 1, 1939.

The four shifts daily were as follows: Number 1 shift, 8 to 11 a.m. and 2 to 5 p.m.; Number 2 shift, 11 a.m. to 2 p.m. and 5 to 8 p.m.; Number 3 shift, 8 to 11 p.m. and 2 to 5 a.m.; and Number 4 shift, 11 p.m. to 2 a.m. and 5 to 8 a.m. A clean, well-heated hog-house was completely equipped with showers, lockers, tables and benches, as well as the inevitable "hot bar" where hot coffee was always available.

The operating organization when using the shield under air was approximately as follows: one man-lock tender, one muck-lock tender and helper inside and one muck-lock tender and helper outside, one hog-house man, one gage tender, three drillers and three helpers, six muckers, one powder watchman, one blaster and one powder monkey, one locomotive man and one brakeman, one shield operator, one foreman and four men in the iron gang building iron as well as bolting, one pipe-fitter, one electrician, and one Heading Boss.

On Sundays and holidays on each shift a foreman, two men, a man-lock tender and a gage tender, as well as a hog-house man, were on duty. They

watched the heading, watched for fires and air leaks and possible signs of cave-in.

### Personnel

The contractor for Section 6 of the Sixth Avenue Subway is Spencer, White & Prentiss, Inc., of New York City. The entire project, including the tunnel-in-air operation, is under the immediate supervision of Lazarus White, President, assisted by Herbert M. Hale, Managing Engineer. H. Pagliaro is General Superintendent, with Harry Talbot, General Tunnel Superintendent in charge of compressed-air operations. The subway is being built under contract with the Board of Transportation of New York City, for which Jesse B. Snow is Chief Engineer, represented in the field by Robert Taylor, Section Engineer, and John A. White, Engineer in charge of the tunnel.

### High-Lift Bodies For Dump Trucks

A new line of high-lift hydraulically operated truck bodies has been announced by the Kewanee Mfg. Co., Kewanee, Ill. Two types are available, both having the high-lift hopper body and high-lift dump, the latter being constructed with a flat bottom and available for various dumping angles from 30 to 50 degrees with clear dumping heights of from 5 to 7 feet.

The subframe, constructed as a unit, may be mounted on any make of truck without alteration. Hydraulic cylinders attached horizontally to the subframe operate on bell cranks to translate the horizontal movement to vertical movement. The relationship of the various parts is such that the oil pressure remains constant during the stroke. This is designed for smooth easy motion and the manufacturer states that no speeding up of the engine is needed for hoisting but that the operation can be accomplished with the engine at idling speed.

The hopper-bottom unit is available with clear dumping heights as high as 8 feet 8 inches and capacities up to 7 tons. The elevated dump truck body is available in capacities up to 8 tons. Hoisting controls for either design are conveniently arranged to be operated either from the cab or outside and are

equipped with limit stops and overload protection. The bodies are made of USS copper steel and the cylinders are of drawn seamless tubing machined and finished to a perfect circle and fitted with pistons with special oil-tight rings

and full long-bearing stuffing boxes. All parts are rugged and designed for heavy service.

Literature describing Kewanee high-lift dump bodies may be secured direct from the manufacturer.



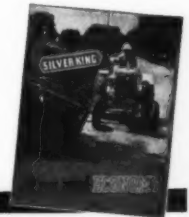
## SILVER KING HIGHWAY MOWER

It's a mower you can depend on in tough places—under all conditions. It's economical, highly efficient, proved by thousands of hours of service in gruelling tests. If you're looking for a mower you'll never have to apologize for—the Silver King is IT! It's a year around unit—mowing, leaf removal, snow removal. Send for the free folder illustrated above.



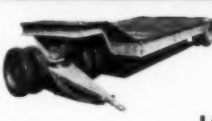
THE FATE-ROOT-HEATH COMPANY  
PLYMOUTH, OHIO

Send for this FREE FOLDER!



# LA CROSSE

## Heavy Duty TRAILERS



The most complete line on the market. Capacities, five to two hundred tons. Four to sixteen wheels. Two to eight axles. They are built to take the heaviest loads safely, and with the least damage to road beds. Write today. Just tell us what you have to move.

LA CROSSE TRAILER & EQUIPMENT CO., LA CROSSE, WIS., U. S. A.

DIVISION OF LA CROSSE BOILER CO.

THE LARGEST TRAILER  
IN THE WORLD IS A  
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## ASPHALT PLANTS

HOT & COLD MIX—ANY CAPACITY  
PORTABLE OR STATIONARY  
STEAM—ELECTRIC OR DIESEL



THE SIMPLICITY  
SYSTEM COMPANY

CHATTANOOGA, TENNESSEE





C. & E. M. Photo  
Coring the Completed Primed Portland-Cement-Stabilized Base with an Acker Drill Mounted on a Truck

## Cement Stabilization On Carolina Highways

(Continued from page 29)

necessary for traffic to cross the primed road at the intersection of county roads and where the old road which was used as a detour road crossed the new location, sawdust was spread over the prime to prevent pick-up by the vehicles. Otherwise the road was closed entirely to traffic. The tar prime always takes a considerable time to penetrate the dense clay stabilized subgrade and during this particular job there was considerable rain which did not hasten matters. After the surface had cured and the small depressions containing a slight excess of the prime had been mopped out, a single bituminous treatment consisting of 0.4 to 0.45 gallon of 150 to 200-penetration asphalt was applied and covered with 37 to 40 pounds of crushed stone of 3/4-inch maximum size. This was thoroughly rolled with a 5 to 8-ton roller. Then the road was opened to traffic.

### Completing the Shoulders

The shoulders on this contract were built up of selected shoulder material. This consisted of any porous top soil full of sod and was spread 4 inches deep. The contractor used a Hough front loader for stripping this material from the fields or pits. It was first disk-harrowed thoroughly to loosen the material for easy loading and also to mix the broken sod through the material. The harrows worked to a depth of 8 to 10 inches.

### The Top-Soil Base

Approximately 2 miles of this contract had a top-soil base. This is a local field material stripped about 6 to 8 inches deep from farmers' fields. While there is some complaint that the removal of this top soil ruins the fields it is believed by some that if the farmer puts the money he receives for the soil back into fertilizer for about two years and also plants crops that aid in building up

the nitrogen content of the soil he is as well off, if not better, after the second year.

The road was fine graded and the top soil dumped down the road 22 feet wide and from 3 to 4 inches thicker than the required finished thickness of 8 inches compacted. First the contractor put in the shoulder material and cut the face vertical to act as a form for the top soil as spread. The top soil was bladed, disked, shaped and opened to traffic until thoroughly compacted. The consolidation was aided by the Bros roller and continuous maintenance with a blade to keep the crown and to prevent any breaking of the thickness.

### Double Bituminous Treatment

The top-soil base was given a double bituminous surface treatment after priming with 0.3 to 0.35 gallon per square yard of 8 to 13-viscosity tar. The first asphalt application was at a rate of 0.4 to 0.45 gallon per square yard of 150 to 200-penetration asphalt at 320 degrees F. Then stone from 1 1/4 to 1/2-inch was applied at the rate of 47 to 50 pounds per square yard from trucks backed over the hot application. The stone was spotted by hand and then rolled with a 5 to 8-ton roller. Traffic was allowed to use the road at this time. A quick seal was applied with the addition of 0.05 gallon of cut-back asphalt to the quantities listed below. A tack coat of RC-1-B was then applied, at a temperature which will not cause any change in viscosity of the cut-back asphalt, at a rate of 0.17 to 0.20 gallon per square yard.

On this tack coat fine aggregate from 1/2-inch to 100-mesh was applied from the truck spreader boxes and as soon as the stone had dried the surface was shot again with 0.2 to 0.25 gallon per square yard of the same cut-back and broomed with hand brooms to insure a uniform spread. The usual practice in South Carolina is to use light drag brooms after the last application of seal cut-back asphalt. The surface was rolled with the 5 to 8-ton roller as soon as the fine aggregate was completely coated. Two or 3 days after the rolling was completed, the road was opened to traffic.

### Personnel

The cement stabilization was done by C. G. Fuller of Barnwell, S. C., for whom Alva Darnold was Superintendent. For the contractor, the Boyle Road & Bridge Co. of Sumter, S. C., T. R.

Furches was Superintendent on the top soil and grading. T. F. Anderson was Resident Engineer for the South Carolina State Highway Department.

## New Twin Welding Hose

The Condor Duplex welding hose, recently announced by the Manhattan Rubber Mfg. Div., Raybestos-Manhattan, Inc., Passaic, N. J., is a twin hose designed for safer and more efficient welding than is possible with separate oxygen and acetylene lines, according to the manufacturer. In the construction of Condor Duplex, two hose lines are held together by a permanent web joint, integrally molded and having both strength and flexibility. The ends are separated 18 inches for the torch end and 24 inches for the tank end for ease in making connections and in handling.

Features of the construction of this hose, which is available in either one or two-braid, heavy-duty braid and spiral cord types, are the strong inner tubes which are smooth and non-porous, and the tough flexible covers that have a maximum resistance to abrasion and aging. The covers are corrugated and are colored red and green to distinguish the oxygen from the acetylene line.

## Line of Heating Equipment

The Hauck line of oil-burning heating and melting equipment, including tar and asphalt melting kettles, asphalt surface heaters, tool heaters, burners for bituminous distributors, lead melting furnaces, weed burners and asphalt plant burners, is described in catalogs of the Hauck Mfg. Co., 116-126 Tenth St., Brooklyn, N. Y. Copies of these catalogs may be secured by contractors and state and county highway engineers direct from the manufacturer by mentioning this magazine.

## New Pump Packing Gland Features Wellpoint Pump

A packing gland with a removable cap has just been announced as a new feature of the Griffin wellpoint pump, made by the Griffin Wellpoint Corp., 725 E. 140th St., New York City, for use in its wellpoint systems. The manufacturer states that this new packing gland greatly reduces the time required to remove old worn-out packing and insert new packing. It is claimed that with this new gland the approximate time for repacking the pump is ten minutes.

Another feature is that with this removable cap, refacing worn or grooved shaft sleeves is possible without dismantling any other part of the pump. There is both a grease and water seal connection in the cap, increasing the life of the packing and reducing operation costs, according to the manufacturer.

Complete information on this new wellpoint-pump feature, as well as on Griffin wellpoint systems, may be secured direct from the manufacturer.

## New Hercules President

Hercules Powder Co., Wilmington, Del., has announced the election of Charles A. Higgins as President of the company. Mr. Higgins, who has been with Hercules since 1915 and has been Vice Chairman of the Executive Committee since 1933, succeeds R. H. Dunham who continues as Chairman of the Board of Directors.

"Federal Aid for highways is not a current expenditure, but rather an investment in a national capital asset. The use of this investment touches and enriches the lives of more American people than any other form of Federal expenditure."

—Rep. Wilburn Cartwright.

RAIL CRANES SHOVELS DRAGLINES ZEE ROTATORS  BROWNING PRODUCTS  DIESEL GASOLINE STEAM ELECTRIC	<h1>BROWNING</h1> <p>has had no peer for 40 years</p> <p>← AT YOUR SERVICE FOR THESE PRODUCTS →</p> <p><b>THE BROWNING CRANE &amp; SHOVEL CO.</b> Established 1899 Main Office and Factory 16226 Waterloo Rd., Cleveland, Ohio Export Department 30 Church St., New York, U.S.A.</p>	CRAWLER, TRUCK AND WAGON DRAGLINES SHOVELS CRANES - HOES  BROWNING PRODUCTS  DIESEL GASOLINE STEAM ELECTRIC
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**"THAT'S A NICE SET-UP OF TAMPING ROLLERS"**

**"YES—IT'S THE BLAW-KNOX convertible type. You can make up any combination desired."**

For compacting earth fills—the practical design of Blaw-Knox Sheepfoot TAMPING ROLLERS appeals to contractors because they give uninterrupted service and meet all modern specification requirements.

The roller units are full floating, on husky frames—built for long, hard use.

Send for complete details and prices.

**BLAW-KNOX DIVISION of Blaw-Knox Co.**  
FARMERS BANK BLDG. PITTSBURGH, PA.

**BLAW-KNOX TAMPING ROLLERS**

What makes that **BLAW-KNOX Concrete Bucket** operate so easily?

Why—the discharge gate is a rubber pad running on roller bearing rollers.

HM—Pretty Slick! no other Bucket like it.

• Controllable discharge, Blaw-Knox CONCRETE BUCKETS are a popular concrete placing unit. Used by contractors everywhere.

Send for a copy of the catalog on Blaw-Knox Concrete Buckets, No. 1586.

**BLAW-KNOX DIVISION of Blaw-Knox Company**  
FARMERS BANK BUILDING PITTSBURGH, PA.

**BLAW-KNOX Roller Gate CONCRETE BUCKETS**

**SAND'S-STEVEN'S**  
Line & Surface LEVEL

Endorsed and Adopted by Road Builders and Contractors

Level is easily and quickly attached to line. Special feature construction prevents accidental detachment from line. Construction is sturdy, and accuracy guaranteed.

**SAND'S LEVEL & TOOL CO.**  
8531 Gratiot Ave. Detroit, Mich.





The Standard Truck-Mounted Maintenance Mixer

### Maintenance Mixer For All Materials

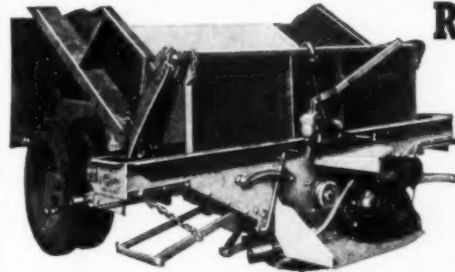
The Standard single-shaft maintenance mixer for all types of oils, asphalt, cement and concretes is built to be mounted on a truck chassis, or for stationary use, and as a truck unit can be driven from the truck power take-off. The mixer is self-dumping and is built in four sizes of 1,000, 2,000, 3,000 and 4,000-pound capacities. The 1-ton size mixes in two minutes and dumps in one minute, according to the manufacturer, the Standard Steel Corp., 5001 So. Boyle Ave., Los Angeles, Calif.

On a strong single shaft are mounted arms with detachable blades which touch the shell and form an outer spiral within the mixer. Supporting these arms is an opposite pitched spiral which forces the core of the load toward the drive end of the mixer. One side of the shell is cut low to facilitate hand loading from gravel or rock stockpiles and the materials in the mixer lie at an angle while mixing. The blades, oppositely pitched, force the material to the discharging end under a pressure which results in a thorough mixing, the manufacturer states. Dumping is accomplished simply by opening the gate at the rear of the mixer, from which the rate of discharge is easily controlled. The blades are detachable and can be quickly replaced. The main shaft bearings are bronze, mounted outboard and thoroughly protected against grit.

A battery of burners to dry and heat the aggregate can be furnished if desired. The burners are mounted along

the low side of the mixer and the flames are shot directly upon the materials. The burners can be operated when the mixer is fully charged without harm or danger,

### Burch Chip-It-Over for CHEAPER—FASTER—BETTER Re-Surfacing • Seal Coating



#### BURCH SANDER

An inexpensive and reliable sander that can be used with any truck. Easy to operate.

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#### THE BURCH CORPORATION

324 THOMAS ST.

CRESTLINE, OHIO

as the movement of the materials prevents damage to the mixture.

Complete information on this maintenance mixer, which is particularly adaptable to the work of state and county highway departments and also for contractors where the job calls for a mobile unit of these capacities, may be secured direct from the manufacturer by mentioning this magazine.

#### Seattle Branch Opened

By Lincoln Electric Co.

The Lincoln Electric Co., of Cleveland, Ohio, manufacturer of arc-welding equipment, has announced the opening of a branch office and warehouse at 1914 Utah Ave., Seattle, Wash. A large stock of electric welders, electrodes and supplies will be maintained to serve that territory. J. B. McCormick, who formerly represented this company in Fresno, Calif., and more recently in Spokane, Wash., will be in charge.

### "... IT TAKES FEWER BLOWS AND DOLLARS TO DRIVE UNION METAL Fluted Monotube Piles"



These Steel Monotubes are light in weight, yet so strong and rigid that they require no core or mandrel. With less inertia to be overcome, faster driving is bound to result because the full force of each hammer blow is transmitted to the driving point of the pile.

Fluted Steel Monotubes offer other features which contribute to lower installation cost. Their light weight makes for easy handling as well as fast driving. They require a minimum of equipment—any contractor can drive them with a crawler crane, leads, and hammer. And after these piles are in the ground, the engineer can inspect them quickly and thoroughly prior to filling with concrete.

Investigate the many advantages of Fluted Steel Monotube Piles now! Write for new catalog No. 68 containing complete product and engineering data.

THE UNION METAL MANUFACTURING CO.  
CANTON, OHIO

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ENGINEERS MONTHLY  
470 Fourth Avenue, New York

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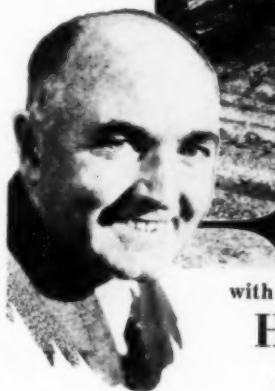
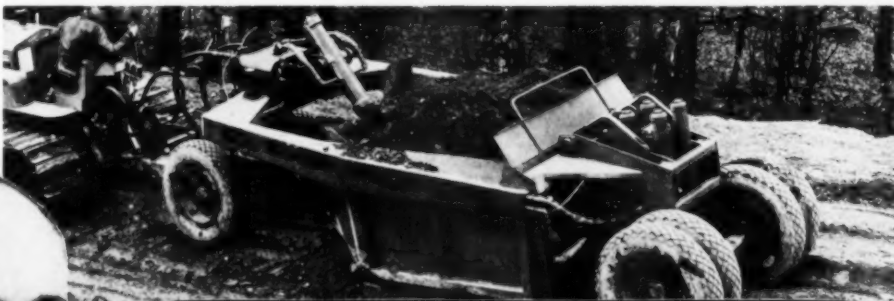
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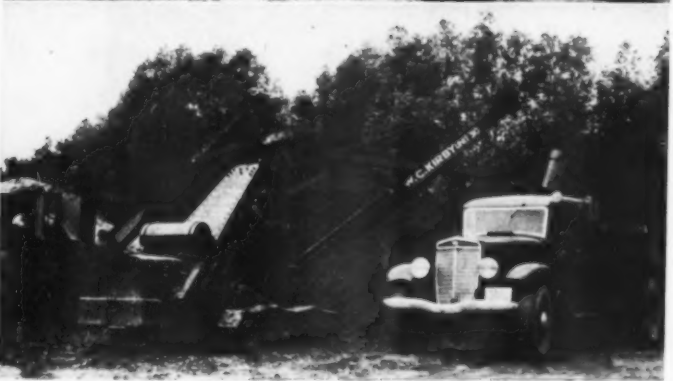
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# Contractors and Engineers Monthly



C. & E. M. Photos  
Mixing and Loading Materials for Widening the Highway Between Montpelier and Burlington, Vt. Upper, Spraying the Aggregate for Mixing. Lower, Large Shovel Mixing the Aggregate and Tar; Small Shovel Loading Mixed Material. See Page 1.



Scenes in the Construction of the 3,708-Foot H-Beam File-Bent Highway Bridge over the Apalachicola River on U. S. 90 in Florida by the Kershaw Contracting Co. of Birmingham, Ala. See Page 6.



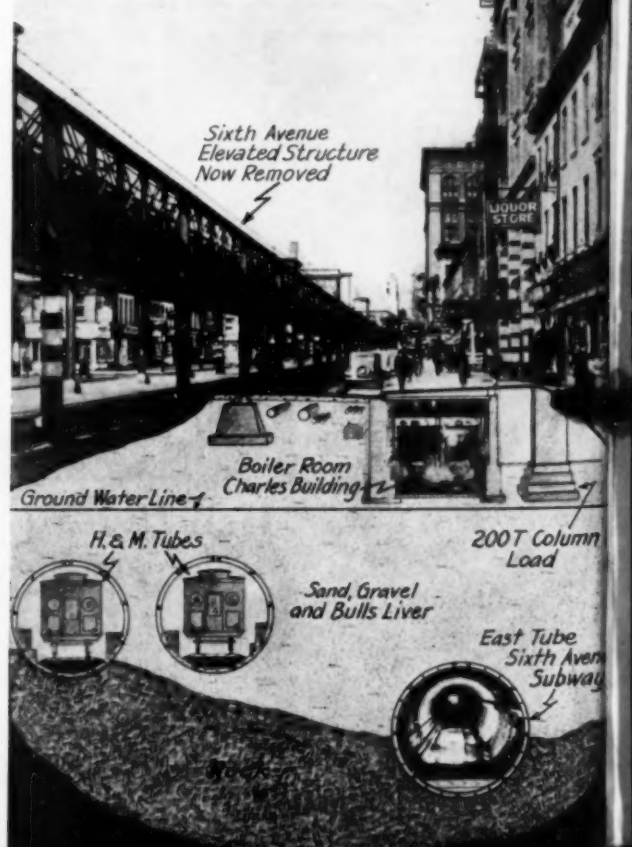
C. & E. M. Photos  
Above and to the Right Are Seen the Hobart Portable Electric Welding Outfit Which Was Used Extensively in the Completion of the Bents and a Man Welding a Sway Brace to One of the Piles. The Lower Photo Shows the Novel Hand-Nail Forms During a Pour. This Is One of the First Bridges in Florida to Be Built with H-Beam File Bents Replacing the Usual Wooden Piles. The Use of Portable Welding Units Greatly Speeded the Work.



C. & E. M. Photos  
Above, a Pusher Comes Up for Action at Prado Dam. Note the Sloping Blades at the Sides for Protecting Tires from Damage, but the Tractor Operators Had a Remarkable Record of Bulls-Eyes. At Left, the 40-Foot Portable Tower with Generator for Lighting the Spillway Excavation at Prado Dam in California. See Page 2.

With the Paver Running Outside the Forms, There Was No Interference with the Steel Men on the Harrison Engineering & Construction Co. Job Between Bay St. Louis and Pearlington, Miss. See Page 2.

Spencer, White & Prentiss, Inc., Contractor for Section 6 of the Sixth Avenue Subway, New York City, Prepared This Combination Photograph and Drawing to Show the Conditions Above and Below Ground, Looking North Between Tenth and Eleventh Streets. See Page 1.





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